The Electrical Industry's Weekly Magazine June 12, 1961

Electrical World

Price 50 Cents

A McGraw-Hill Publication

Georgia Tops in Commercial Electrically Heated Buildings

. . . page 81

AEC Cuts Uranium Prices

. . . Page 44

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YOU CUT SOCKET COSTS UP TO 50% WITH GENERAL ELECTRIC'S NEW 200-AMP RINGLESS DESIGN WITH NEW MANUAL BY-PASS

General Electric's new 200-amp ringless design offers you today's best socket buy. Consider cost. New SI-60 is priced as much as 50% less than any other fully-rated 200-amp socket. Consider advanced design. Operation of G-E's new, exclusive screw-operated manual by-pass is fast, simple...requires no special tools, jumpers or clips, just a screwdriver . . . self-contained, positive action. Unique terminal block assembly—with one-piece combination jaw and connector strap—offers greater reliability through low heat rise. And consider versatility. To increase application, help cut stock costs, G-E's new SI-60 socket fully meets industry requirements for aluminum or copper wire. For complete information contact your G-E Sales Office or Authorized Distributor. Or, write General Electric Company, Somersworth, New Hampshire.

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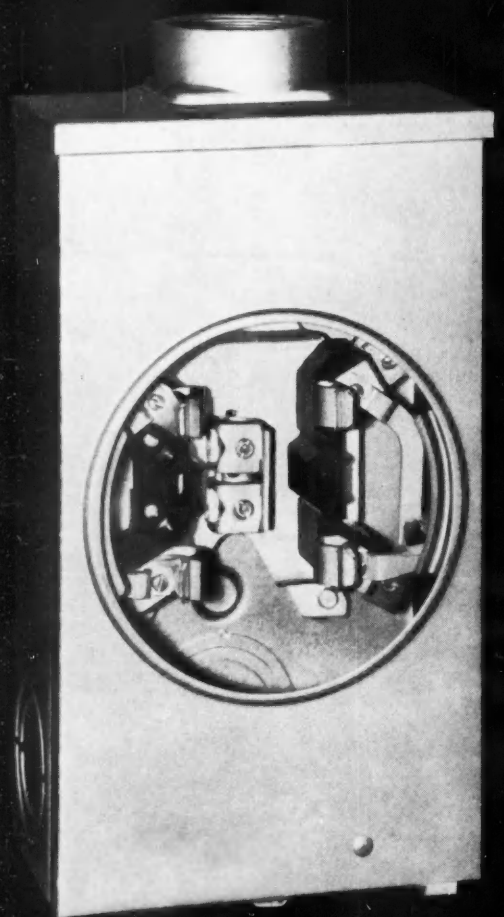

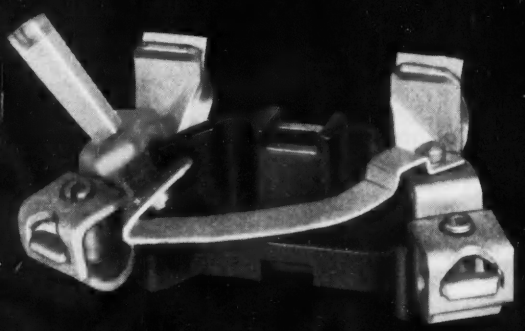

NEW, EXCLUSIVE G-E MANUAL BY-PASS is self-contained on terminal block; provides fast, positive make or break action, requires only a screwdriver...no special tools, jumpers or clips. Socket cover can not be closed unless by-pass is open.

NEW G-E 200-AMP SI-60 RINGLESS SOCKETS now provide quality meter protection at low cost.

GENERAL ELECTRIC

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

June 12, 1961
Vol. 155, No. 24

Dateline...

US May Alter Lagging Atoms Program

Washington, D. C.—AEC chief Glenn T. Seaborg and Congressional Joint Committee on Atomic Energy Chairman Rep Chet Holifield (D-Calif.) are in complete agreement that the record of the civilian nuclear power program up to now falls short of the mark.

Seaborg says the record is "disappointing." Holifield scores the program's "lack of achievement."

[*In a move that trims the cost of nuclear power, the AEC has reduced the price of uranium. For that story and the industry's reaction, see p* 44.]

Why has nuclear energy failed to find an important place in the nation's power growth? Seaborg and Holifield hold some strong opinions on the proper answer to this question.

Both claim the civilian nuclear power program has been unsuccessful primarily because the "partnership approach" between the government and utility groups has not worked. Seaborg and his top staff advisors now say the program must have a sure-fire plan of finance under which construction of full-scale nuclear plants may be assured. They warn that the experience under "partnership" terms of the past two years holds no guarantee that full-scale plants will be built as they are needed.

Holifield says he prophesied from the very beginning of the government-industry cooperative development program that the financial burdens it imposed on a single group or groups of electric companies to develop the atom were too great. He stresses the lack of construction starts on power reactors for the second year running as proof of investor-owned utility reluctance to shoulder its part of the developmental costs.

There is unanimity in the where-do-we-go-from-here views of the AEC and JCAE chairmen. Both are talking of re-initiating the campaign for a federal program of building and initially operating the first series of commercial-size A-plants.

Seaborg has sketched out the way work on the federal nuclear power plants would be undertaken. Roughly, the construction-finance ground rules parallel those employed for the Shippingport project:

(*Continued on page* 5)

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2

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3

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Electrical World

Dateline . . .

Washington (*Continued from page* 3)

"The AEC, using fixed-price competitive bidding among private contractors, would construct complete plants on publicly or privately owned utility power grids; the utility would operate the plant and buy electric power from the plant for a fixed period at some predetermined rate developed under competitive proposals from utilities. At the end of the fixed period, the utility would be committed by contract to purchase (and the government to sell) the plant at a price which would allow it to compete with conventional plants of the same size."

In point of time, the federal construction program is to get off the ground next year. Seaborg tells the Joint Committee that meantime the cooperative program will not be entirely abandoned, that AEC can find ways under the present partnership ground rules to move ahead with three prototype reactors authorized by Congress two years ago.

All three prototypes are considered necessary building-block steps toward building and operating commercial size plants using a number of different reactor types. These three are the 50-Mw Improved Cycle Boiling Water Reactor (ICBWR), the 20-Mw Small Size Pressurized Water Reactor (SSPWR) and the 50-Mw Organic Moderated Reactor (OMR).

Seaborg also assures Republican Joint Committee members that the investor-owned utility industry will be fully canvassed as to its views and that there will be ample discussion with industry on future approaches taken by the government's nuclear power program.

Holifield, anticipating the new features to characterize the forthcoming nuclear power program, says additionally:

"I foresee no changes or new role for the private companies to assume in the development program. But then, far be it from me to dictate what private power should do."

Letters

Commends LBE Editorial

To the Editor:

Please accept my sincere thanks for the splendid editorial ("Where Are the Missing Companies?" EW, May 15) relative to the Live Better Electrically program and the proposal that all companies support it.

Naturally, we agree with you in every respect. This is the goal we have set for the activity and hope to accomplish without, in any way, watering down a strong, competitive advertising program favoring the use of electricity.

I hope you will express to your people our appreciation for your editorial support.

James T. Coatsworth,
Commercial Director
Edison Electric Institute

The Switch Is to Electric

To the Editor:

The other day there was an article about heating in a Swedish paper stating that there is a striking tendency towards the exchange of oil-heating for electric heating both in apartment houses and private villas in the USA.

One article on this problem has, according to the Swedish paper, been inserted in the "Electrical World Magazine." We suppose that the paper aimed at is the magazine published by you, the *Electrical World.*

As one of our customers is very much interested in reading the article, we ask you kindly to send us this number as soon as possible.

V. Godin
Paul U. Bergstroms Aktiebolag
Stockholm, Sweden

▶ The Swedish magazine is right in concluding that there is an increase in electric heating in the USA, but our studies appear to indicate that the installations are more likely to be in new homes than as replacements for other heating systems in old homes. We are sending along a copy of last week's special report and the brand-new Electric Heating Survey.

This is your column in Electrical World. Address correspondence to Letters Editor, Electrical World, 330 *W* 42*nd St, New York* 36, *N. Y.*

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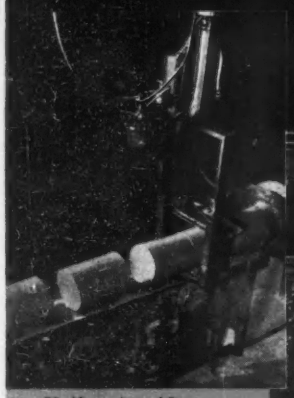
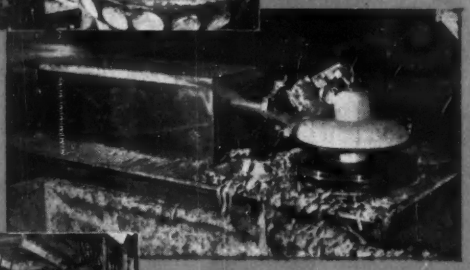
Modulus of rupture measurement, a routine laboratory check on strength of porcelain bodies, body-and-glaze combinations and sanded cementing surfaces.

At Lapp, suspension



Uniformity of Lapp suspension discs begins with the billets of clay, automatically extruded and sliced to exact size.

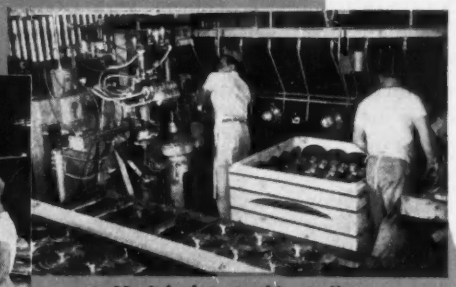
Automation all the way! Plunging of lower surfaces of suspension discs is by this automatic machine.



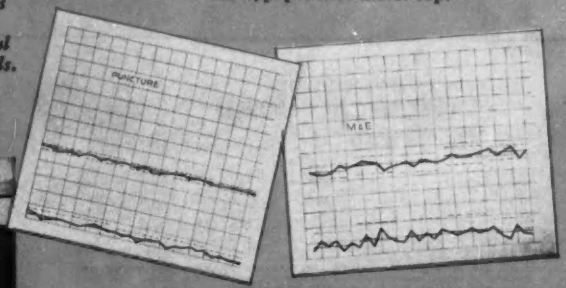
Plunged blanks, their moisture content controlled by an exact temperature-humidity-time cycle, are automatically trimmed to precise size and shape.

Uniform thickness of resilient paint on pins within insulator head is assured by this automatic pin-dipping machine.

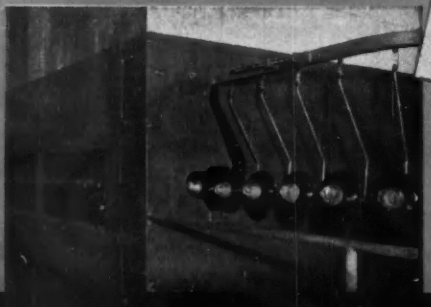
Glazing is mechanized, too, by this machine which glazes insulator shells and applies uniform internal and external sand cementing bands.



Mutiple-duty machine pulls each insulator at Proof Test Load and trims off surplus cement, paper used under cap.

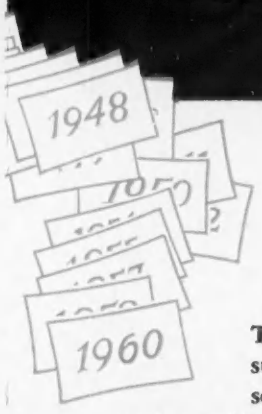


A fixed percentage of production is allocated to quality control testing. Charts like these, of M&E and puncture values, show the continuing improvements in characteristics and uniformity resulting from Lapp production mechanization.



Every Lapp suspension unit is tested mechanically and electrically. This conveyor carries finished insulators through 60-cycle flashover test for a minimum period of three minutes.

insulator design and production are matters of continuous improvement



we make 'em good...
...and keep making 'em better

Take a look at your last shipment of Lapp suspension insulators. Compare them with some of Lapp's 40-year-old veterans you'll find serving on lines all over the country. You probably won't notice much difference. Yet they're nearly as different as is today's Thunderbird from 1920's Model T.

That's because product improvement is a continuous program with Lapp. We re-design, we test, we prove—and year-by-year we build valid improvements into our insulators and our production processes.

The results? Significant strengthening of every measurable characteristic. Elimination of even the maverick under-strength (and over-strength) individual units. Mechanization of every phase of production, for predictable uniform response to all test standards.

That's the way it is at Lapp. We make 'em good... but we keep making 'em better. And this extra we put into our suspension insulators merits your confidence when you install them, and means extra service after they're up.

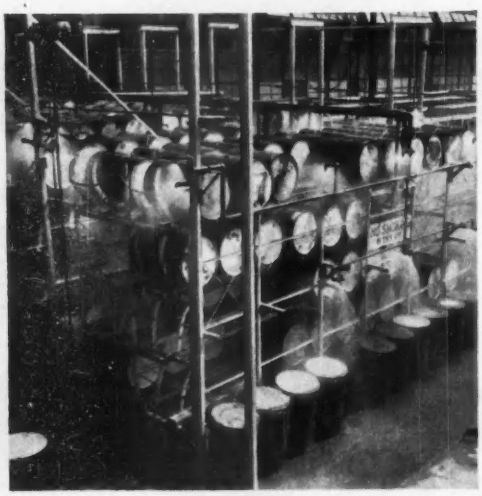
Lapp Insulator Co., Inc.,
Le Roy, N. Y.

Lapp

Whatever your special fire hazard, Grinnell has the right system for you

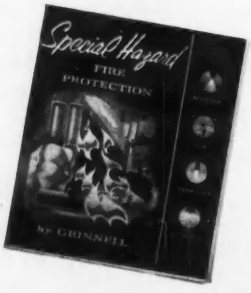
The basic fire extinguishing agents are shown on the chart below with the most common applications cross-referenced by check marks. If your process requires a specially designed system — the research and test facilities of the Grinnell Company stand ready to serve you.

Extinguishing blanket of foam completely covers the floor of this aircraft hangar. 5,897 foam-water sprinklers protect property worth a billion Air Force Defense dollars.



Water spray, applied to outside storage of paints and solvents, cools to inhibit internal pressure build-up and dilutes to prevent flammable vapor-air mixtures from developing.

SPECIAL FIRE HAZARD	WATER SPRAY	FOAM	CARBON DIOXIDE	DRY CHEMICAL
AIRCRAFT HANGARS	✓	✓		
ALCOHOL STORAGE	✓	✓	✓	
AMMUNITION LOADING	✓			
AMMUNITION MAGAZINES	✓			
ASPHALT IMPREGNATING	✓			
BATTERY ROOMS			✓	
CARBURETOR OVERHAUL SHOPS	✓	✓	✓	✓
CLEANING PLANT EQUIPMENT	✓	✓	✓	✓
DOWTHERM	✓			
DRYING OVENS	✓		✓	✓
ENGINE TEST CELLS	✓	✓	✓	
ESCALATORS, STAIR WELLS	✓			
EXPLOSIVES: MANUFACTURING, STORAGE	✓			
FLAMMABLE LIQUIDS STORAGE	✓	✓	✓	
FLAMMABLE SOLIDS STORAGE	✓			
FUEL OIL STORAGE	✓	✓		
HANGAR DECKS	✓	✓		
HYDRAULIC OIL, LUBRICATING OIL	✓		✓	
HYDRO-TURBINE GENERATORS	✓		✓	
JET ENGINE TEST CELLS	✓	✓	✓	
LIGNITE STORAGE AND HANDLING	✓			
LIQUEFIED PETROLEUM GAS STORAGE	✓			
OIL QUENCHING BATH	✓	✓	✓	✓
PAINTS: MANUFACTURING, STORAGE	✓	✓	✓	✓
PAINT SPRAY BOOTHS	✓		✓	✓
PETROCHEMICAL STORAGE	✓	✓	✓	
PETROLEUM TESTING LABORATORIES	✓	✓	✓	
PRINTING PRESSES			✓	
REACTOR AND FRACTIONATING TOWERS	✓			
RECORD VAULTS			✓	
RUBBER MIXING AND HEAT TREATING	✓			
SHIPBOARD STORAGE	✓		✓	
SOLVENT CLEANING TANKS		✓	✓	✓
SOLVENT THINNED COATINGS		✓	✓	✓
SWITCHGEAR ROOMS			✓	
TRANSFORMERS, CIRCUIT BREAKERS (outdoors)	✓			
TRANSFORMERS, CIRCUIT BREAKERS (indoors)	✓		✓	
TURBINE LUBRICATING OIL	✓	✓	✓	✓
VEGETABLE OIL, SOLVENT EXTRACTION	✓	✓		



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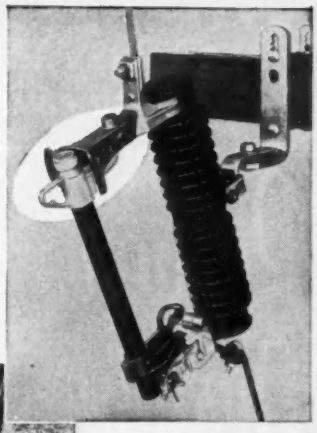
...eliminate danger of external arcing ...prevent recoil damage



KEARNEY

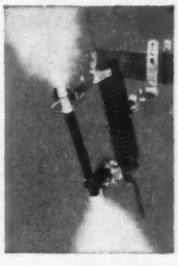
"FOLLOW-ACTION"

LOCKS CONTACTS CLOSED UNTIL FAULT IS INTERRUPTED

Stainless steel springs in the top contact assembly of the Kearney GX cutout, absorb shock... and by "following" any motion of the cartridge created by recoil impact, keep the top contacts firmly locked together under high pressure until the fault has been interrupted. Contacts cannot separate during interruption to cause external arcing or contact burning.

Ball and socket contacts are self-aligning, cannot be bent or twisted out of alignment by severe faults, and always seat properly regardless of the angle of cartridge close-in. Dependable, safe operation is assured.

Balanced Double Venting . . . prevents recoil damage. Expendable cap blows on high faults. Expulsion gases discharge from **both** ends of the GX cartridge to equalize pressure and neutralize recoil shock. At the same time, relief of excess pressure within the cartridge prevents tube bursting. On low amp faults, the GX cartridge single-vents from the bottom only, assuring ample gas pressure for positive interruption.



Cast Bronze Hood . . . prolongs cutout and contact life by protecting top "follow-action" contacts from severe weather and ice. Hood also shields contacts from dirt and corrosive elements, providing added insurance of dependability and long life. Extra-wide entry jaws guide cartridge securely into contacts even at awkward close-in angles.

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812

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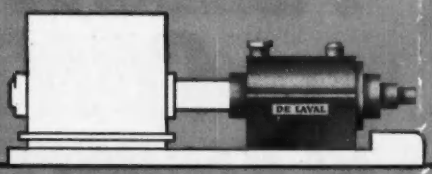
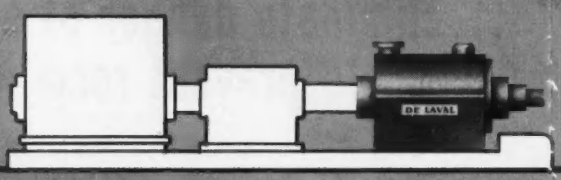
BOILER FEED PUMPS

Proven Design Flexibility and Experience

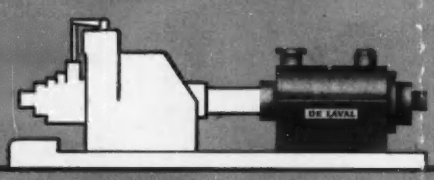
Direct Motor Drive
Atlantic City Electric Co.
2000 HP 125 MW



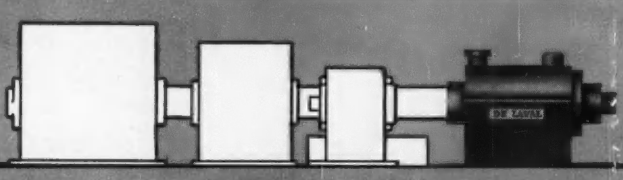
Motor-Hydraulic Coupling Drive
Commonwealth Edison Co.
5000 HP 325 MW



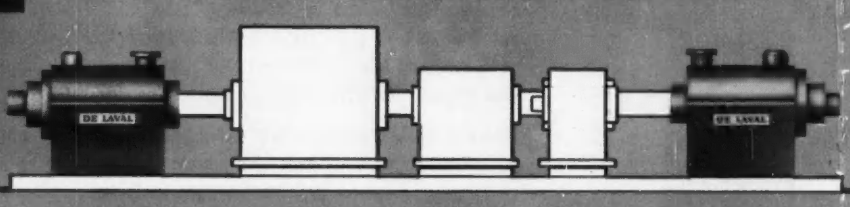
Turbine Drive
United States Steel Corporation
1400 HP 44 MW



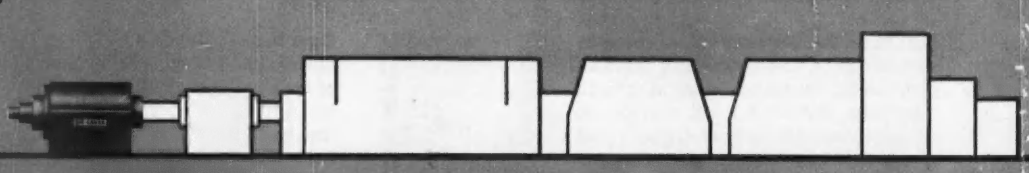
Motor-Magnetic Coupling—Gear Drive
South Carolina Electric & Gas Co.
2500 HP 5100 RPM
125 MW



Supercritical Cycle
American Electric Power System
4000 HP 6500 RPM 5500 PSIG 120 MW



Main Generator-Shaft Drive
Commonwealth Edison Co.
4900 HP 325 MW
(FUTURE UNIT)

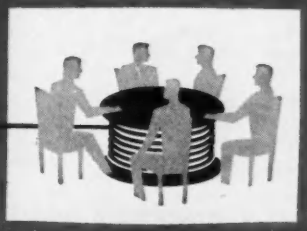


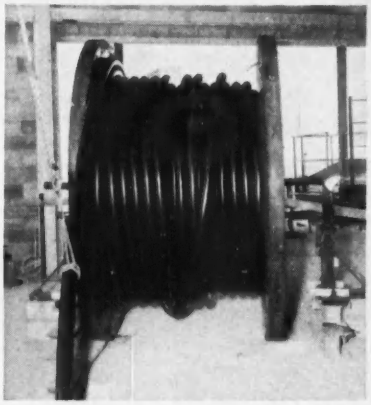
Main Turbine-Shaft Drive
Pacific Gas & Electric Co.
5250 HP 330 MW

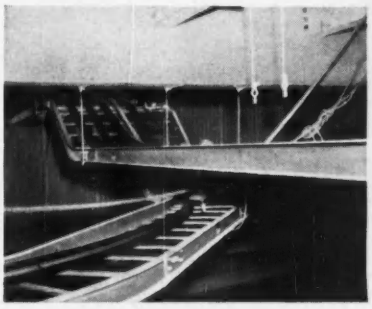
DE LAVAL STEAM TURBINE COMPANY
861 NOTTINGHAM WAY, TRENTON 2, N. J.

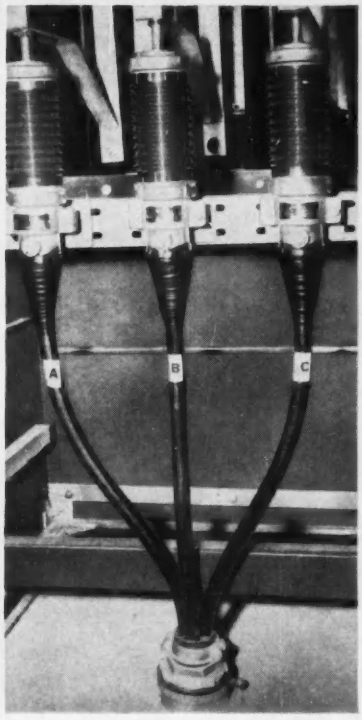
DU PONT

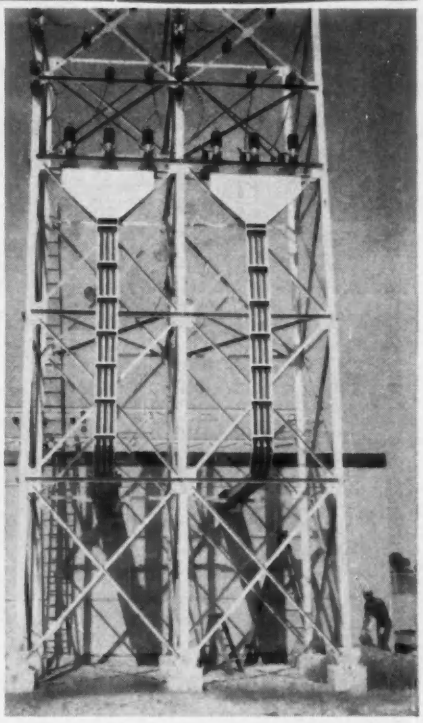
WIRE AND CABLE ROUND TABLE











Insulating and jacketing properties of ALATHON® allow innovations in 15 KV plant hookup

The pictures above were taken at a recent plant installation. They represent some construction and installation innovations made practical through the use of ALATHON polyethylene resins, as the insulation and jacket on the 15 KV cable shown.

The cables feeding from potheads in the tower to switchgear inside the building were completely pre-engineered and pre-assembled. In transit from the manufacturer, only the stiffening corners were removed to allow the bus to fold back upon itself. For installation, the corners were reassembled, and the entire feeder assembly installed in a minimum of time and expense.

Elsewhere in the plant, long lengths of the power cable were easily pulled through serpentine cable trays. For terminations, such as in the center picture, engineers designed new air-filled potheads instead of compound-filled.

To a large degree, these innovations depend upon the properties imparted by ALATHON. Because of its extremely low dielectric constant (2.28) and power factor (0.0002), insulation of ALATHON 3B, NC-10, is thoroughly reliable. Its outstanding resistance to corona, particularly at critical bend areas, is also of major importance.

As a jacketing material, high-molecular-weight ALATHON 1000, BK-30, offers trouble-free durability under a variety of severe environmental conditions. As a combination, the two compounds produce a cable of smaller dimensions with utmost reliability.

Whatever your specific cable construction, the use of ALATHON almost invariably results in a lighter, more flexible cable and one which is easier to install. A wide selection of specialized formulations of ALATHON is available to meet the electrical and environmental requirements of various installations. For more information, consult your wire and cable supplier, or write: Du Pont Company, Dept. EW 612, Room 2507A, Nemours Bldg., Wilmington 98, Del. *In Canada:* Du Pont of Canada Ltd., P.O. Box 660, Montreal, Que.

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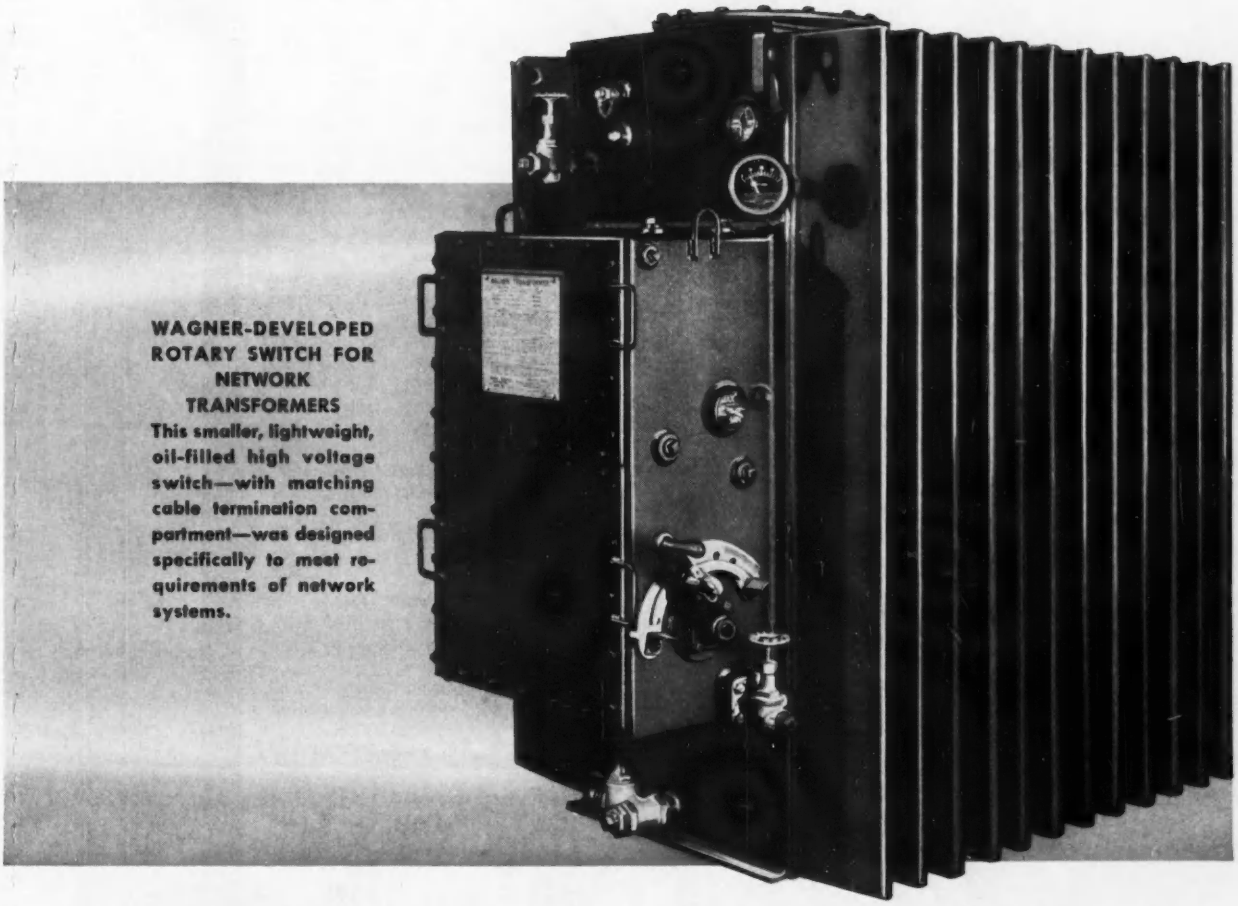

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*Patents applied for.

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The exclusive offset yoke* not only facilitates bucket entry — *it increases versatility and working range.* Angle of the yoke — coupled with 90° lower arm, 135° upper arm travel — permits work over parked cars, over and between power and telephone lines, and on the property side of the pole. It reaches up 40', rotates 360° continuously in either direction.

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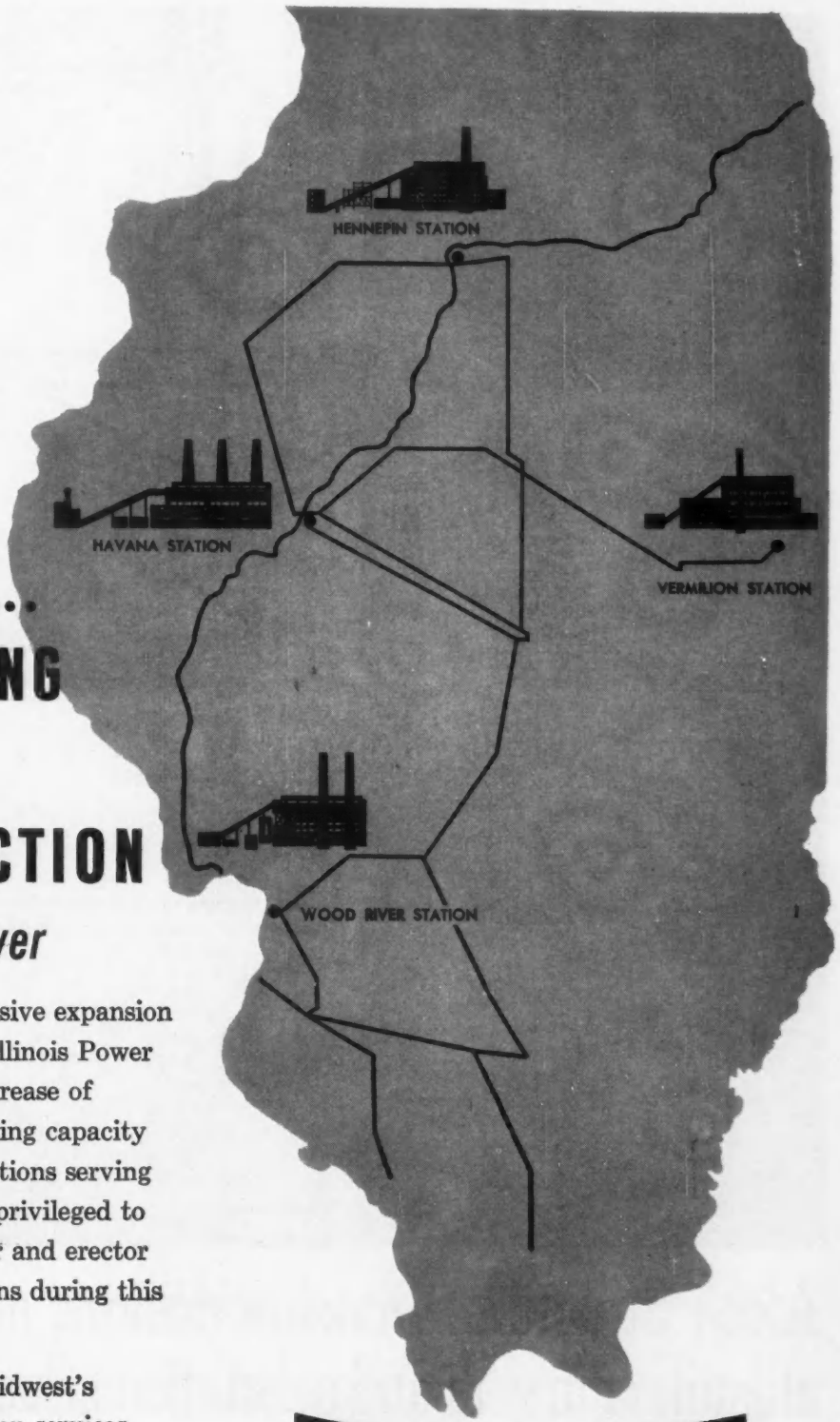

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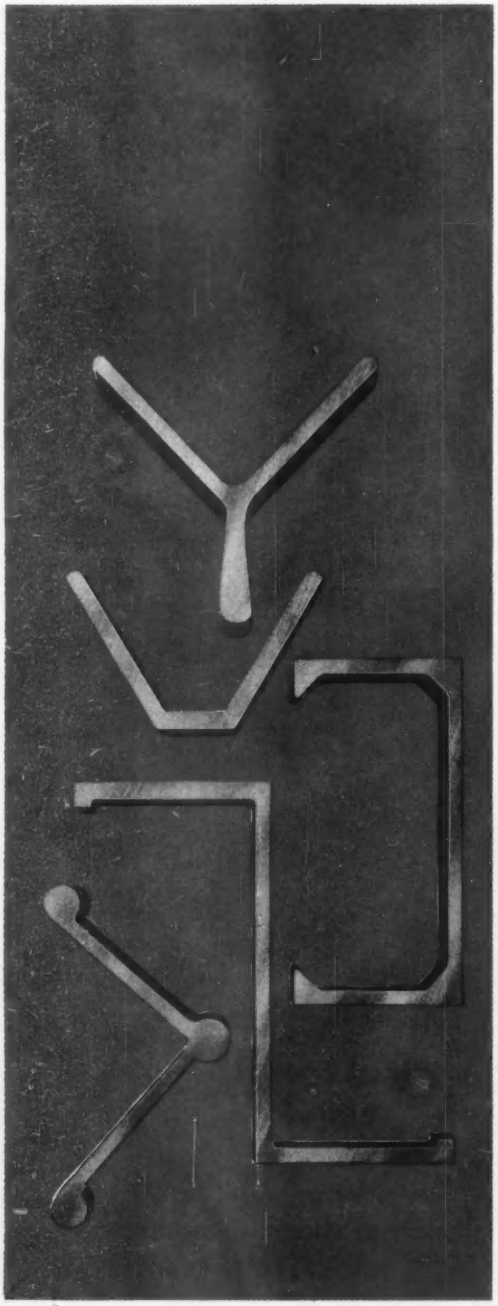

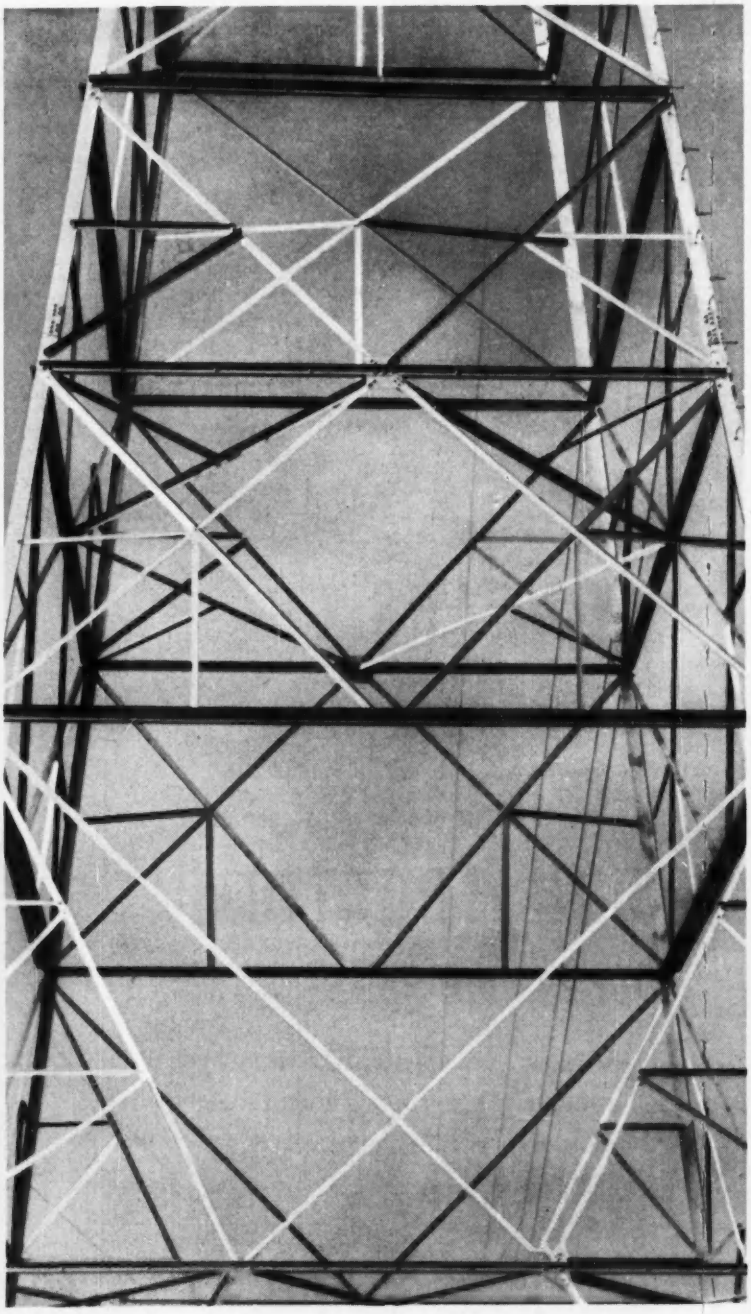

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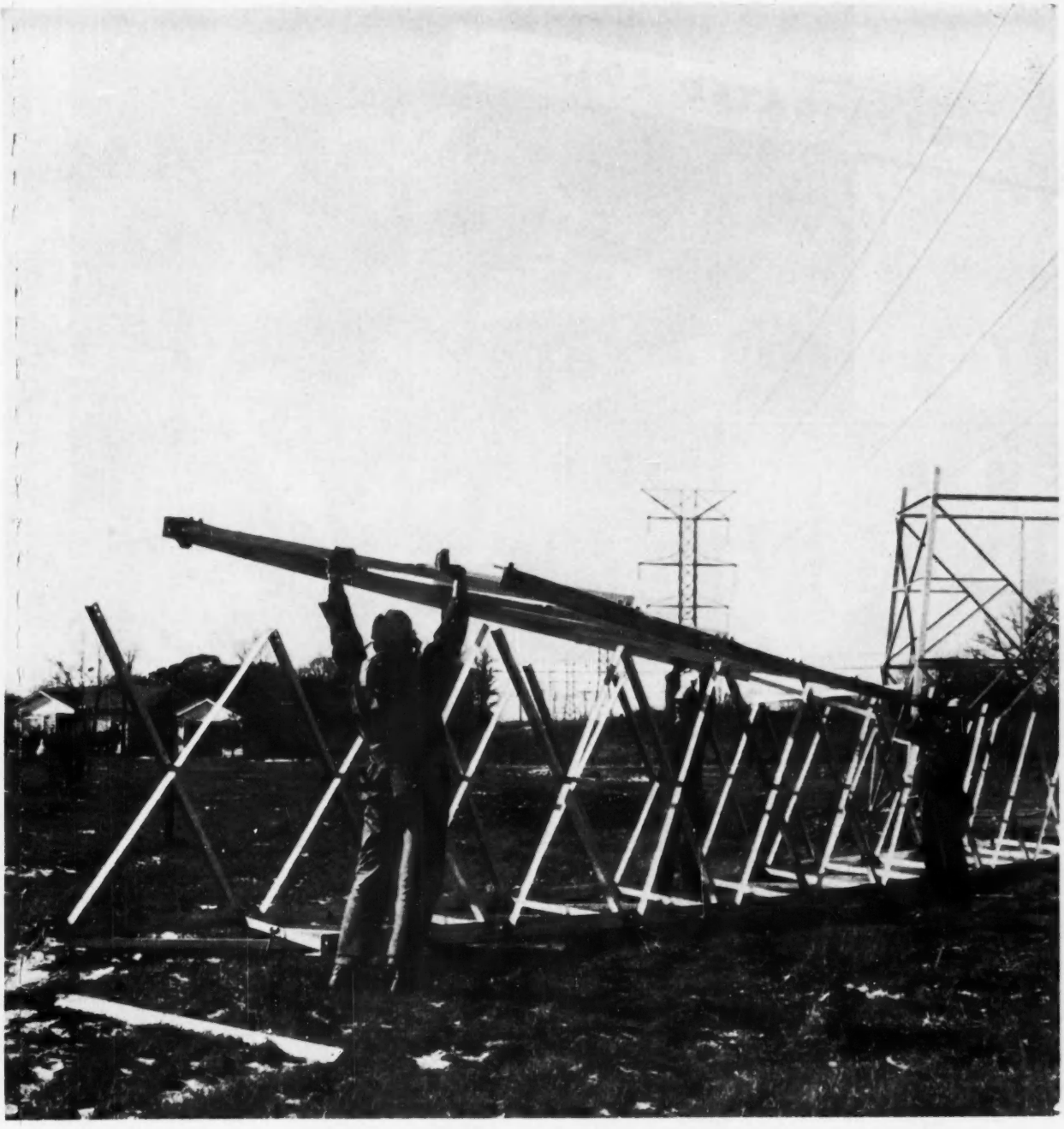

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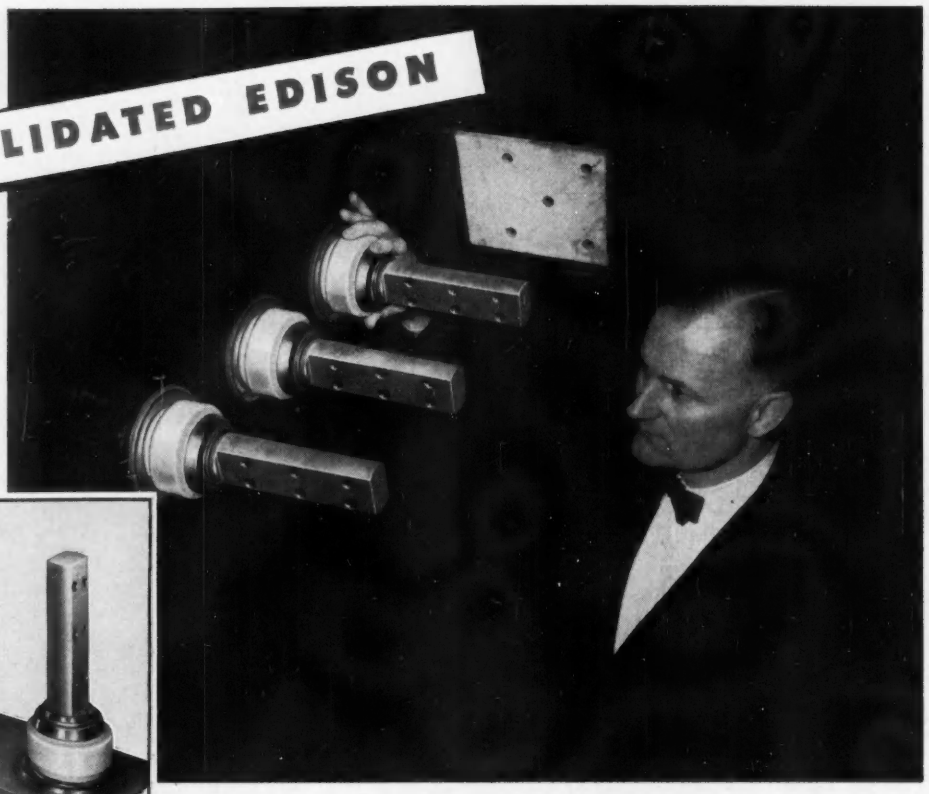

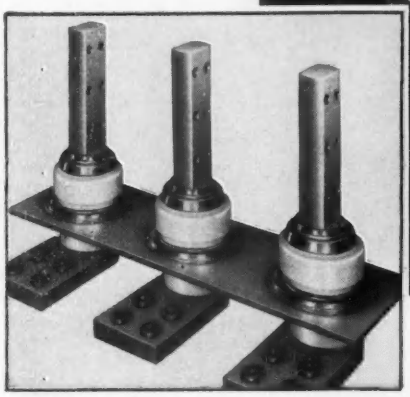

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Consolidated Edison has long been a leader in fostering advances in the field of electric power. One long-sought goal has been a completely sealed network transformer, which would prevent troublesome, costly leakage and inhalation of moisture. To this end, Consolidated Edison has pioneered in the elimination of gasketing and low temperature solder seals from these units.

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- Alite provides mechanical strength characteristics and thermal shock properties far exceeding those of glass or porcelain;
- Alite retains its superior dielectric properties even at elevated temperatures;
- Where required, Alite can be furnished with a smooth, hard, easy-to-clean high-fired glaze to assure high surface resistivity;
- Alite is rugged, corrosion- and abrasion-resistant.

Uniformly reliable Alite components may be just what you, too, need for those applications where service conditions are extremely severe or critical. Write us about your specific requirements. Our ceramic specialists will provide all possible assistance.

WRITE FOR FREE HELPFUL BULLETINS

Bulletin A-7R gives useful comparative data. Bulletin A-40 describes Alite facilities and Alite's complete line of Standard Bushings.

385-G

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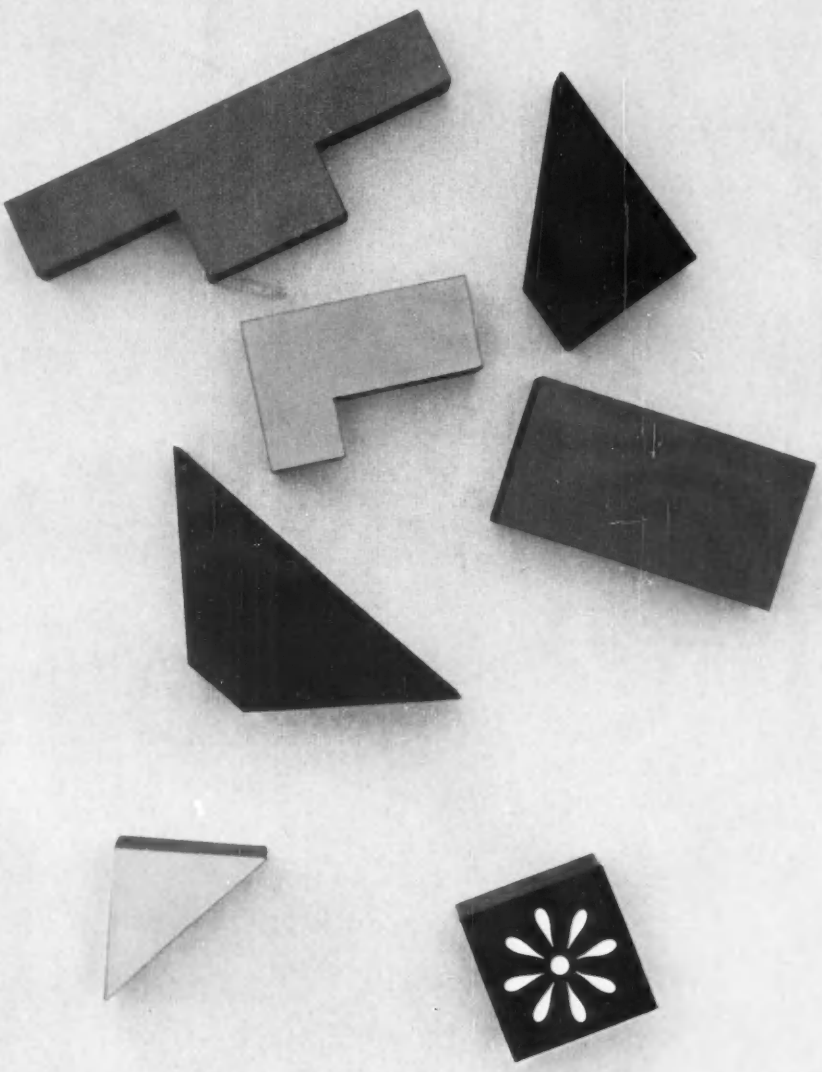
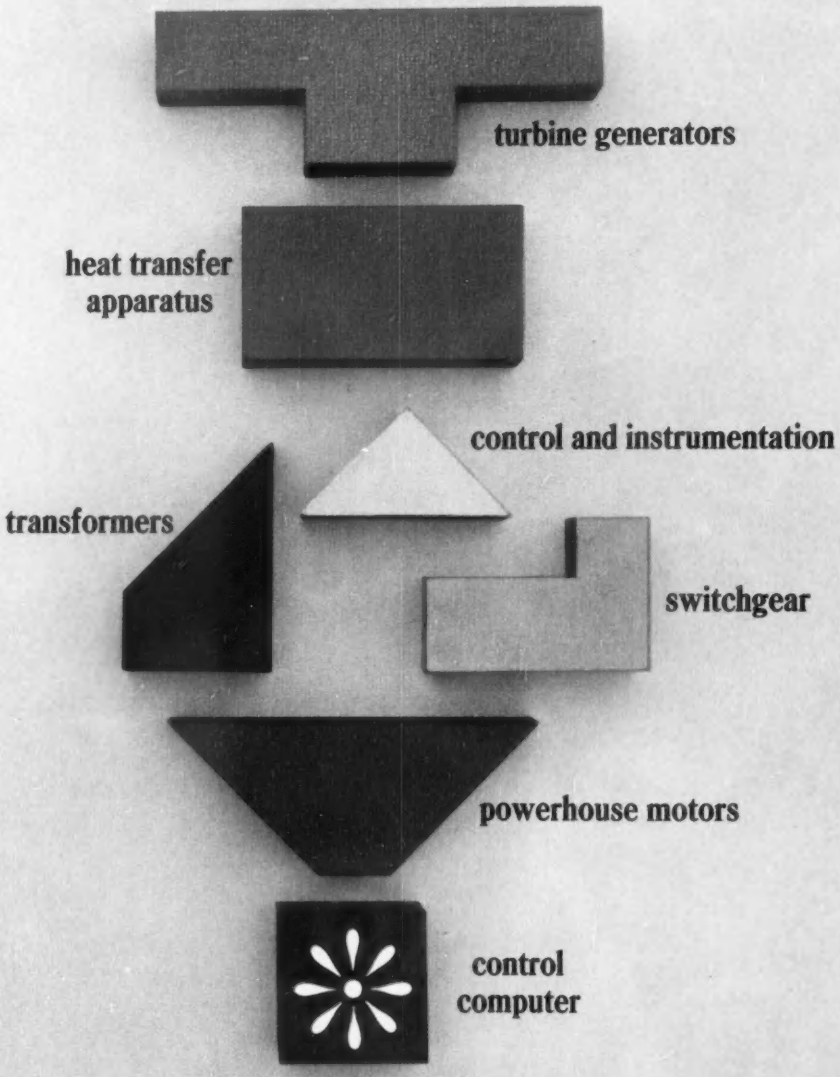
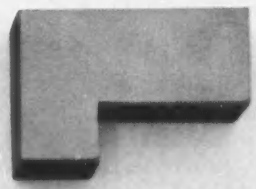


When you are still in the thinking and preliminary planning stages for your proposed automatic power plant, call us in. Because we produce more lines of major power plant equipment than any other manufacturer, such as

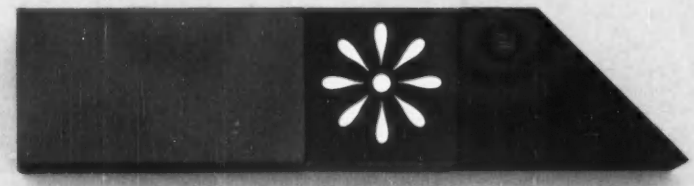


and, based on our analytical and system engineering experience–we can contribute practical advice to help you and your consulting engineer develop your plant design and specifications.

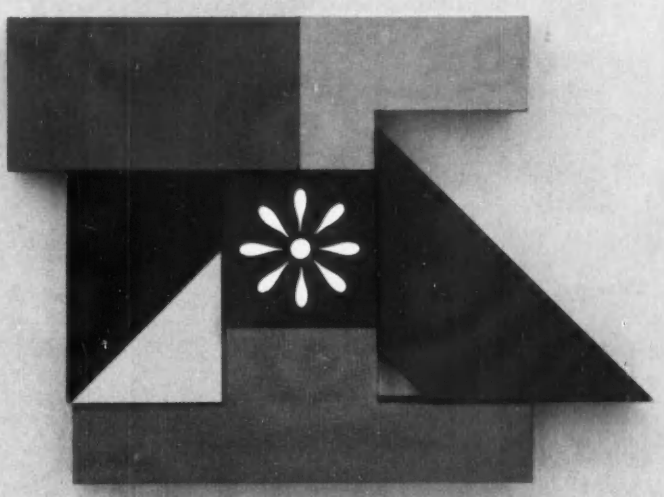
When you have determined the requirements of your power plant, we will furnish proposals on whatever individual equipment you wish...



or any group of equipment...

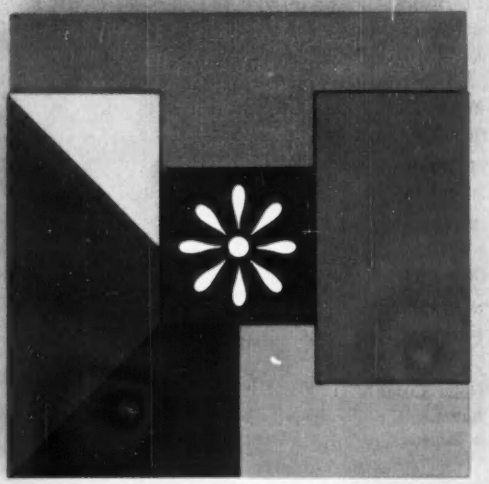


or all equipment including associated auxiliaries.



We have the experience and capability to design this equipment with characteristics to meet your specifications exactly.

When you order Westinghouse Prodac*-IV computer control you receive the benefits of exhaustive power plant process analyses through which were developed process equations based on plant equipment characteristics. This background enables us to provide the exact programming you require, and factory test its performance in the Prodac-IV computer by simulation methods before shipment. Even emergencies and failures can be simulated to make sure the control system will be able to handle the plant under abnormal conditions.



Finally, this complete capability places us in a position to suggest changes in equipment or plant cycle which will facilitate automation and provide optimum plant efficiency. You can get solutions to more automatic power plant problems from Westinghouse than from any other equipment supplier.

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Electrical World

JUNE 12, 1961
Vol. 155, No. 24

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NEXT WEEK

EEI'S 29TH ANNUAL CONVENTION is covered in an eight-page report.

The Electrical Week

LATE NEWS ▶ **Indictments on charges of price fixing** are handed down against six manufacturers of pole line hardware by a federal grand jury in Milwaukee. Defendants named are Oliver Electrical Mfg Co, Utilities Service Co, Hubbard & Co, McGraw-Edison Co, Joslyn Mfg & Supply Co, and A. B. Chance Co. Hearings are set for June 26.

Great Britain's Central Electricity Generating Board places a $4.2-million order with English Electric for the first switchgear for the 400-kv supergrid. The order is for thirteen 35,000-Mva air blast breakers and allied equipment to form a complete switching station.

Dairyland Power Cooperative, La Crosse, Wis., is selected by AEC to operate a 50-Mw forced circulation, internal steam separation boiling water reactor. The project takes place of the improved cycle boiling water reactor AEC originally planned to build in cooperation with cities of Los Angeles and Pasadena. Allis-Chalmers will design and build the unit.

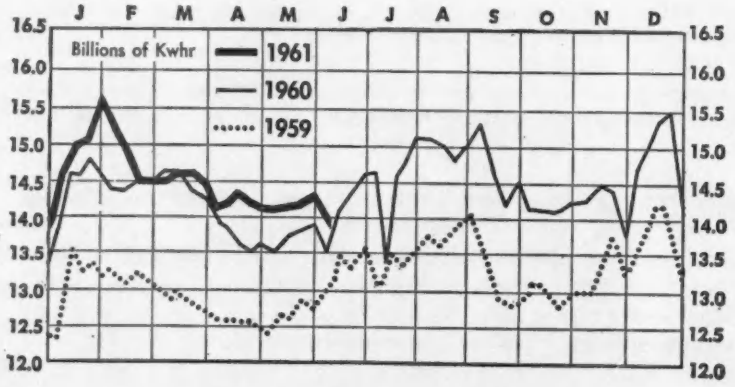
EEI President Sherman R. Knapp, commenting on AEC's price reductions for uranium (see p 44), said: "The Atomic Energy Commission's decision to reduce its base charge for enriched uranium is welcome news to the utility industry. It is our understanding that the new price schedule will bring into better balance the relationship between AEC's fuel charge and the current market price of natural uranium." **On the same subject,** Allis-Chalmers says, "The decrease in fuel cost and the increase in use charge will result in a net savings of about 10% for a 60-Mw Pathfinder-type reactor, and about 20% for a 300-Mw plant. . . . We believe it is part of a trend in the right direction."

Philip A. Fleger is named president, and W. W. Lynch vice president of EEI. Fleger is board chairman and president of Duquesne Light Co, and Lynch is president of Texas Power & Light Co. Accepting the presidency, Fleger said: "Recent developments in our national capital indicate that, in the very near future, we may have to act with even greater unity and with even greater awareness of national problems affecting us than we have in the past."

A heart attack claims the life of J. K. "Pat" Flanagan, 59, vice president of Florida Power Corp, and widely known electric utility public relations expert.

WEEKLY POWER OUTPUT—Up 2.8%

(Week ending June 3), Kwhr 13,887,000,000



Percent Change From Previous Year

	May 20	May 27	June 3
Total U. S.	+ 3.8	+ 3.2	+ 2.8
New Eng.	+ 6.7	+ 6.6	+ 4.8
Mid. Atlan.	+ 4.4	+ 3.8	+ 2.9
Cent. Indust.	+ 1.2	+ 1.9	+ 1.0
West Cent.	+ 5.4	+ 2.2	+ 3.9
Southeast	+ 2.7	+ 2.8	+ 4.2
South Cent.	+ 8.5	+ 4.8	− 0.4
Rocky Mount.	+ 7.7	+ 9.3	+ 7.5
Pacific			
NW	− 1.9	− 3.7	+ 4.9
SW	+ 8.1	+ 8.0	+ 2.9

Seasonally Adjusted Index 282

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Source: Edison Electric Institute

Supply Lines

FLORIDA P&L REJECTS TURNKEY PROPOSALS FOR PORT EVERGLADES

Florida Power & Light Co has rejected turnkey proposals and has purchased the turbine-generators and boilers for two identical units for its new Port Everglades plant in Fort Lauderdale direct from manufacturers. In addition, it has awarded Ebasco Services a single-responsibility contract covering the purchase of all other plant equipment and supplies in addition to engineering and constructing the entire plant, McGregor Smith, board chairman of the Florida utility, told *Electrical World*.

The two identical turbine-generator units are to be supplied by General Electric. They are rated 350 Mw and have a maximum gross capability of 425 Mw. Units operate on steam at 2,400 psi, 1,000/1,000F, supplied by Foster-Wheeler boilers rated 2,600,000 lb per hr. The first unit is scheduled for operation in April, 1964, and the second in April, 1965.

Smith said that Florida P&L expects installed cost of the two units to be only slightly above the $80 per kw cost of similar units purchased under a turnkey type of contract by Texas Electric Service Corp (EW, Nov. 14, 1960, p 54). The slightly higher unit cost was attributed to the fact that the Port Everglades units are designed for oil or gas firing and have provisions for coal burning in the future. The increased costs include concrete stacks for coal firing which may be 300 ft high. FP&L also faces an unknown foundation problem in the form of quicksand at Port Everglades. Construction of this foundation work will be done under a separate contract supervised by Ebasco, it was reported.

The Port Everglades plant addition will be of outdoor construction, which has been used by Florida Power & Light Co successfully for many years. Port Everglades is currently the state's biggest power producer, as its present capacity is 480 Mw. The second of its first two 240-Mw units began operation last month. Addition of the two projected 350-Mw units in 1964 and 1965 will bring capacity at Port Everglades to 1,180 Mw.

WASHINGTON: THE TUMULT AND THE SHOUTING DIE . . .

What's next for the electrical industry following the noisy series of hearings into price fixing charges against it by Sen Estes Kefauver's Antitrust and Monopoly Subcommittee?

Testimony by General Electric Co's chairman Ralph J. Cordiner (see page 47) and Commerce Secretary Luther Hodges wraps up the inquiry. But Kefauver isn't going to let the subject drop. To understand what the Tennessean has in mind, one should keep in mind the concept of what inquiries by Congressional committees are for.

All of them, of course, must have some legislative purpose—they must be designed to gain information to help Congressmen pass laws. But more informally, Congressional hearings are used as a sounding board to stir interest, both in the Congress and among the public. This is one of Kefauver's main reasons in calling for the inquiry into the government's price-fixing charges. He hopes to create a climate within Congress that will make stiffening of the federal antitrust laws possible.

Congressmen are traditionally reluctant to tinker with antitrust. But if Kefauver has succeeded in arousing enough interest among his colleagues in the violations uncovered by the Justice Department among competitors in the industry, he may be able to get some legislation through.

So far Kefauver has introduced no bills. But he has some in the drafting stage. They would stiffen penalties for antitrust violators; extend legal responsibility for violations up the corporate ladder to top management, and make it easier for the Justice Department to take price-fixing cases into court.

It's not clear what, if any, effect Kefauver's hearings will have on prices in the industry. All signs now point to a strengthening of price levels in electrical equipment. But buyers are still complaining about receiving identical bids, and, as his hearings progressed, Kefauver devoted more and more time to questioning electrical executives about the phenomenon of identical bidding—an old favorite theme of his.

He's getting help from other quarters. President Kennedy has ordered that all identical bids received by federal agencies be reported to the Justice Department. Kennedy hopes that publicizing the practice will cut down on it and, hopefully, allow the government to get a better price on products it buys.

This is a ticklish and complex subject. There is, of course, nothing illegal about identical bidding, and there is no real feeling in Congress that it should be outlawed. Antitrust legislators realize that this would be an impossible legislative task.

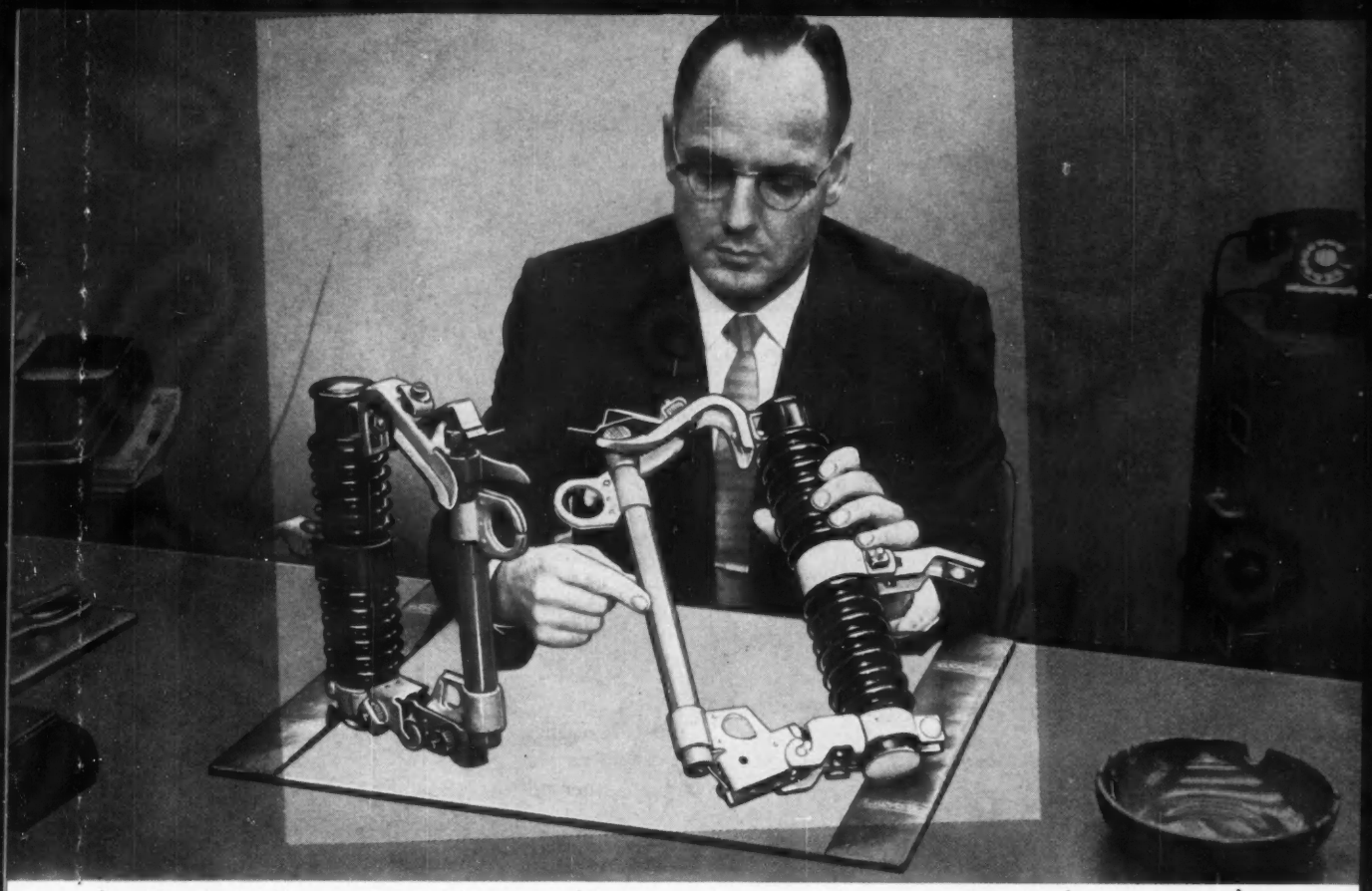
What may happen, though, is that constant talk about the immorality—rather than the illegality—of identical bidding will force manufacturers to take steps consciously to alter bids on catalog items so they will not be identical with competitors', and this could, conceivably, result in lower prices to customers. But this provides no solution, and its effect remains to be seen.

CLEVELAND REJECTS SECOND SET OF IDENTICAL METER BIDS

The city of Cleveland has received a second set of identical bids on 4,060 watthour meters and Mayor Anthony Celebrezze called representatives of the four bidders—GE, Westinghouse, Duncan and Sangamo—to his office last week to discuss the bidding. "It's an insult to our intelligence to submit identical bids twice in a row," declared Celebrezze, as he indicated he would forward information on the bidding to the antitrust division of the Justice Department for immediate action.

The second city bid invitation added a clause that asked for bids on 493 used meters owned by the city, but none of the companies were interested, claiming the used meters are valueless either for resale or salvage.

Donald E. Craig, general manager of GE's meter department, said "We will stick with the bid the way it is unless the city wants us to withdraw." He added that a further effort would be made to convince city officials that "identical bids do not mean collusion." Representatives of the companies involved argued after the first set of identical bids in April that all prices quoted were published in the catalogs of the various companies.



Ray Rowe, Product Manager, Protective Equipment and Capacitors, exhibits first production sample of the new economy type EDO fuse cutout. Built to meet the demand for low price, it offers many desirable features. Ask the L-M Field Engineer to show you a sample.

New $16 L-M Open Type EDO Fuse Cutout Meets Need For Economy, Performance

To fill the requests of many operating companies for an economically priced, medium duty, open type cutout, L-M offers the Type EDO. Designed for savings plus performance, the EDO can be used with complete assurance where high fault capacity is unnecessary. Although maximum interrupting capacity is below present NEMA standards, the EDO has been tested and proved over the range of operations for which it has been designed.

The EDO has many desirable features, developed through L-M's many years of experience as a leader in fuse cutouts. The unit is small, compact. Fuse tube closes fully from any angle. Takes any standard button-head link. Fully bird-proof. Non-ferrous current-carrying parts. Rated at 100 amperes. The 7.8 kv unit costs as little as $16; the 15 kv is as low as $18. Available with link-break attachment if desired.

RATINGS AND INTERRUPTING CAPACITIES

Voltage Rating —KV	Current Rating— Amperes	Interrupting Capacity— Amperes	Minimum 60 Cycle 1 Minute Dry Withstand Voltage —KV RMS*	Minimum 60 Cycle 10 Second Wet Withstand Voltage	Impulse Withstand Voltage on 1½ x 40 Microsecond Wave—KV*
7.8	100	3000	27	24	75
15	100	2000	35	30	95

*In accordance with "NEMA Standards For High Voltage Fuses," Section SG2-3.18.

Get complete information on fuse cutouts

L-M offers a complete line of protective equipment, including a variety of both open and closed cutouts. Ask the L-M Field Engineer for information from L-M's extensive file on system protection. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

513

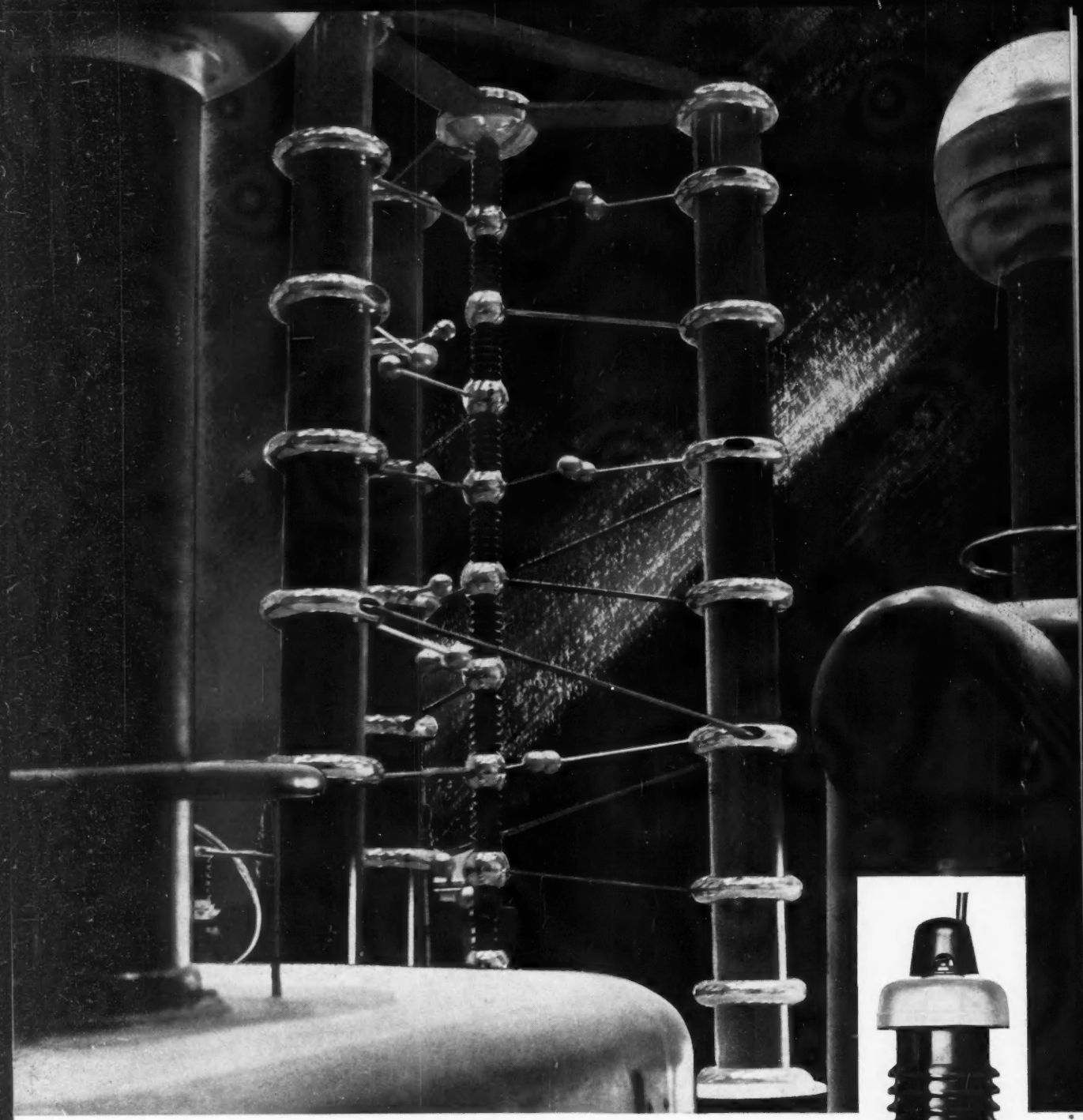
OUR 50TH YEAR 1911 — 1961

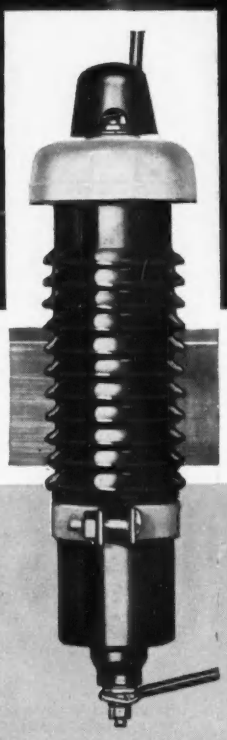
LINE MATERIAL® Industries

McGRAW-EDISON CO. *Protective Equipment*

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT





L-M's revolutionary new E-5 distribution arrester is possible only because of L-M's 20 years of experience in system protection, its 2,000,000 arresters in service, and the knowledge of lightning gained through many laboratory facilities, such as the new high voltage laboratory, a portion of which is shown here.

LINE MATERIAL® Industries

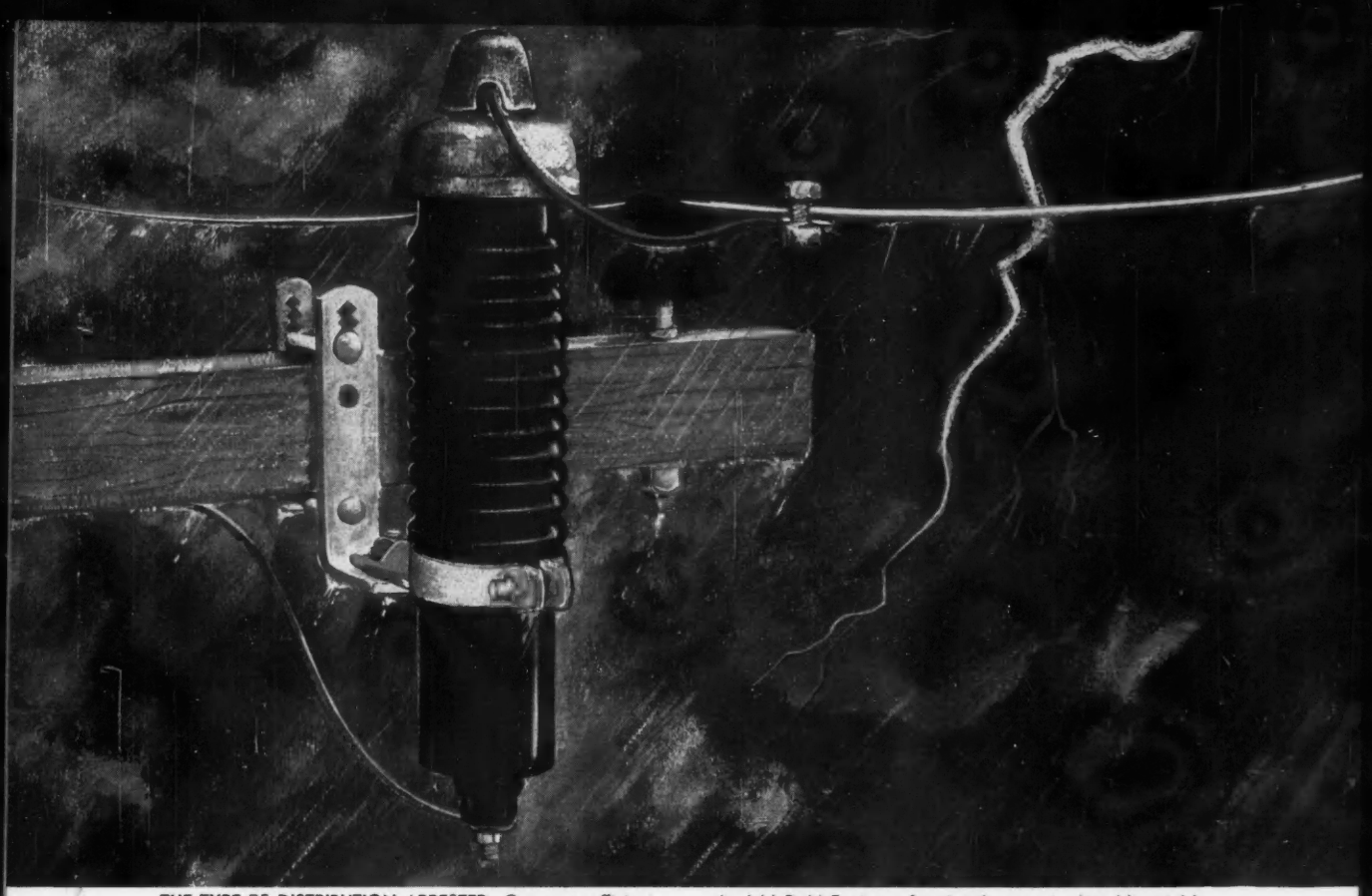
McGRAW-EDISON COMPANY

Lightning Arresters

McGRAW EDISON

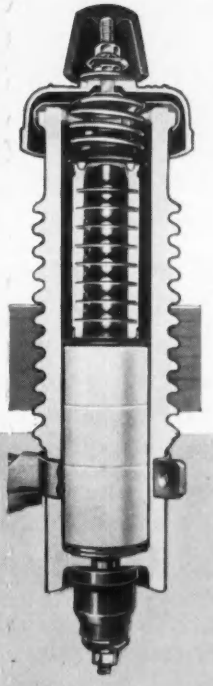
514

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS
OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



THE TYPE E5 DISTRIBUTION ARRESTER. Compact, efficient, with better electrical characteristics. Excellent long-life protection. Also available in externally gapped (T5) design. Ask the L-M Field Engineer for details, or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

L-M Offers Concept Of Total System Protection With New Type E5 Arrester



New distribution arrester design with high-intensity copperized valve blocks provides low sparkover and low discharge voltage; retains excellent thermal and follow-current characteristics.

Adequate lightning protection consists of low sparkover and discharge voltage, for safe margin; high thermal capacity, for long life; low follow current, for minimum system disturbance; and universal system application, unlimited by available 60 cycle fault current magnitudes.

None of these factors can be considered separately. All apply equally. This, then, is the total concept of lightning protection which Line Material introduces in its Type E5 distribution arrester. Thus, when you buy the Type E5 arrester, you get balanced, lasting protection resulting in low total costs.

CUTAWAY VIEW OF THE E5 (T5 internal construction is similar) shows the long-life ladder gap, valve element of copperized, ceramic-coated silicon carbide blocks that provides low sparkover, high discharge capacity, fast response, with outstanding current limiting characteristics. Be sure to ask your L-M Field Engineer for more information.

OUR 50TH YEAR 1911 — 1961

515

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Lightning Arresters

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
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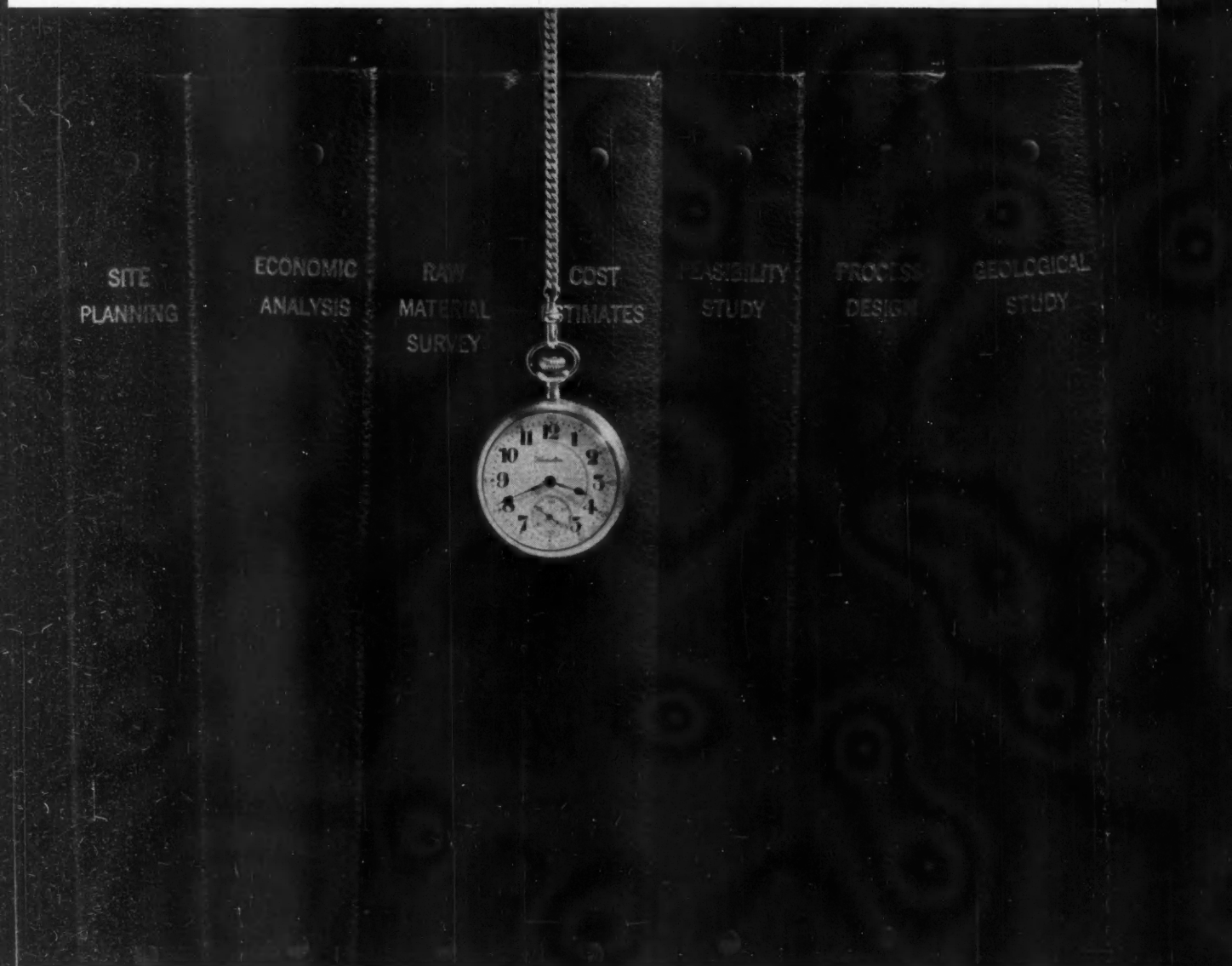
OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Pre-Engineering by **KAISER ENGINEERS** answers basic plant expansion questions...



Timely? Many complex factors shape the final decision to proceed with your expansion plans...and timing is an important one. Independent analysis of all aspects of your proposed program is the *Pre-Engineering* service offered by Kaiser Engineers. The studies and evaluations furnished by KE Pre-Engineering represent only one phase of total KE services. Kaiser Engineers designs and builds all types of power plants—steam-electric, gas turbine, combined cycle, nuclear, and hydro-electric. From Pre-Engineering through design and construction, Kaiser Engineers provides complete, one-company service and ingenuity based on years of experience.

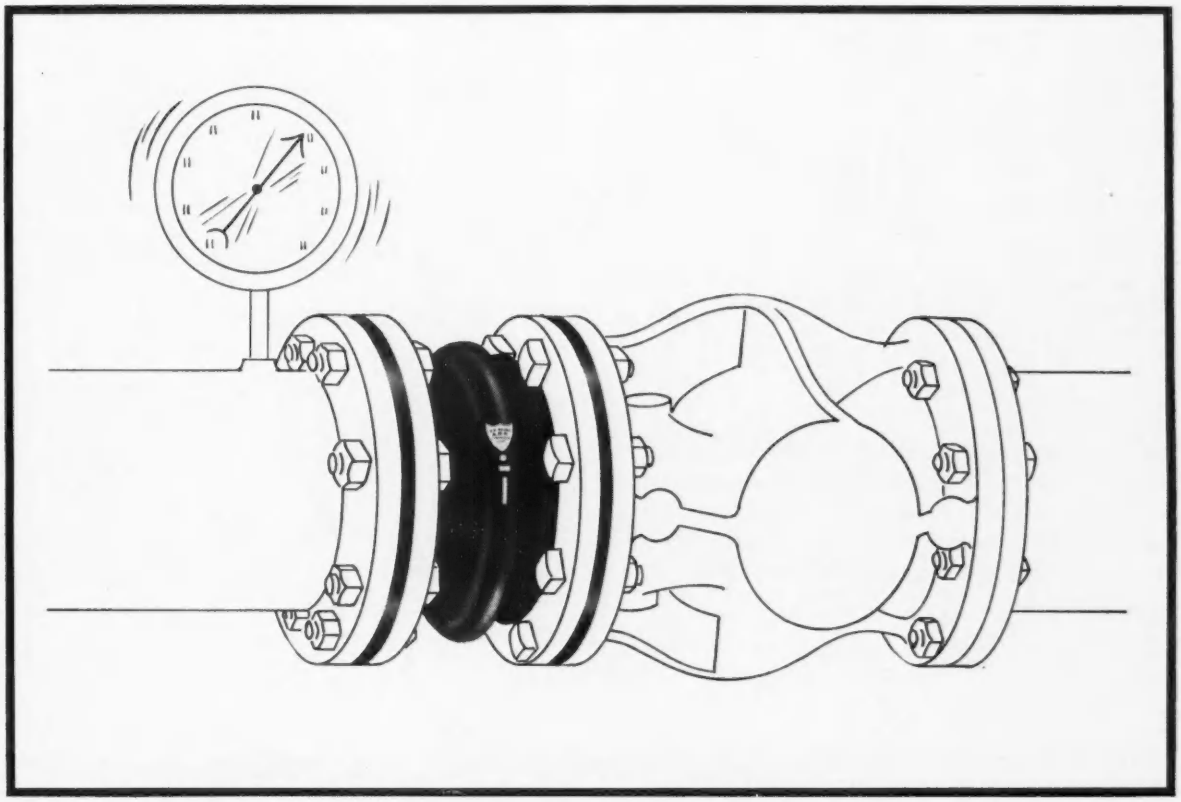
KAISER ENGINEERS

KAISER ENGINEERS engineers-contractors
Contracting since 1914

Oakland 12, Calif. — Chicago, New York, Pittsburgh, Washington, D.C.
Accra, Buenos Aires, Montreal, New Delhi, Rio de Janeiro, Sydney, Vancouver, Zurich

6228-P

U.S. EXPANSION JOINTS



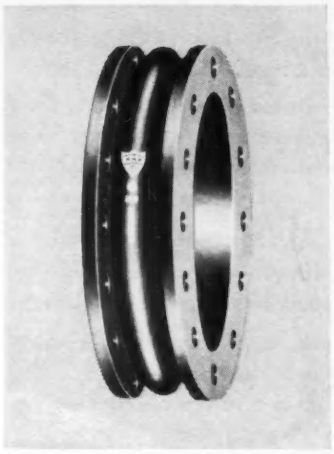
U.S. AMR Expansion Joints
handle even the highest surge pressures safely

Today's power and processing systems require piping that withstands flow surges, high pressures, and high temperatures unheard of a few years ago. Going hand in hand with improved piping is the simultaneous demand for better expansion joints.

U. S. Rubber . . . the company that brought you the *first* rubber expansion joint . . . now brings you the new AMR expansion joint, designed to meet today's most rigid requirements.

The AMR Expansion Joint:

- Has a new, patented inner construction with built-in *surge* protection for increased service life.
- Withstands higher continuous working pressures—pressures that exceed even the capacity of conventional wire-armored expansion joints.
- Has the flexibility of standard joints.
- Is available now in materials for handling corrosive chemicals and/or wide temperature ranges.



Your "U. S." representative will call at your request to give you the full facts and samples of this revolutionary development in rubber expansion joints. Why not call him . . . or write US at Rockefeller Center, New York 20, New York.

WORLD'S LARGEST MANUFACTURER
OF INDUSTRIAL RUBBER PRODUCTS

United States Rubber
MECHANICAL GOODS DIVISION

First from General Electric (1959)... another bright idea that became a better lamp for you...Quartzline lamp

packs more light in less space than any other filament lamp

Listen to the nearsighted Mister Magoo . . . "1959? Seems like last week! I volunteered but the authorities picked seven other Astronauts—and General Electric invented the Quartzline lamp. Happy birthday, Quartzline. Tarnation! This confounded pen won't write!"

Understandable mistake, Mister Magoo. The 5-inch, 500-watt Quartzline *is* no bigger than a pen. But it's 19% more efficient than a regular lamp, never grows dim, and provides better light control than any earlier lamp.

Every Quartzline lamp stays almost 100% bright throughout its life—because General Electric engineering leadership found a way to keep tungsten vapor from blackening the glass. G.E. puts iodine gas in the lamp to catch the particles evaporating from the tungsten filament. Miraculously, the iodine re-deposits them, over and over again, on the steadily-bright filament. This process makes the 5-inch Quartzline last 2000 hours, twice as long as a regular bulb-shaped lamp.

Use Quartzline with the right reflector, and it'll give a precise, powerful, rectangular beam of light in one direction—as narrow as 6° or as wide as 100°. No elaborate lens system is needed.

Or take the big-brother model, the 10-inch, 1500-watt Quartzline. It's *50% more efficient* throughout its life than a standard 1500-watter of comparable voltage.

Applications? Stadiums. Airport runways. Building facades. Show windows. Inspection or outdoor work areas. Don't worry about rain and snow. Quartzline resists thermal shock.

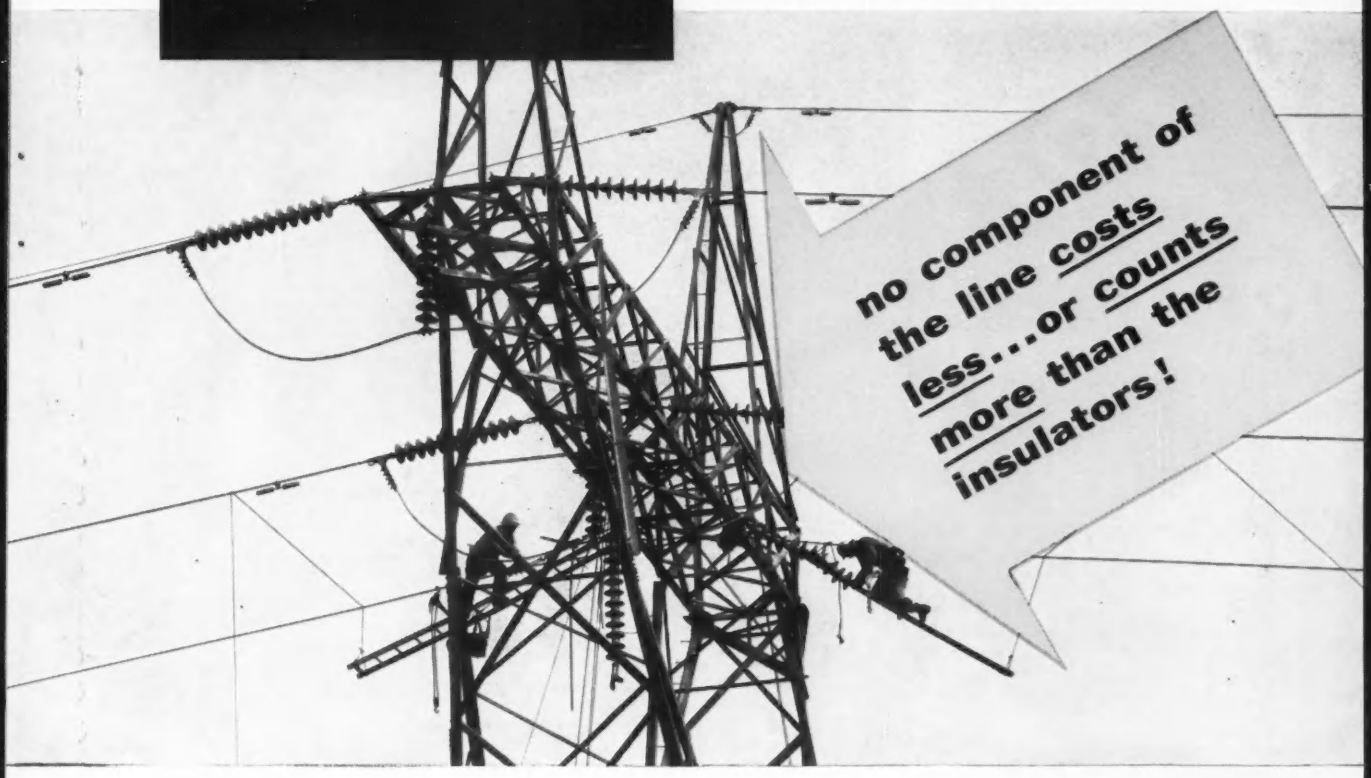
Ask your G-E distributor for more information on Quartzline lamps—small proof of General Electric lighting leadership! General Electric Co., Large Lamp Dept. C-110, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

line cost– $85,000 per mile

insulators– $2,500 per mile



This tower has a busy future ahead. It's insulated now for a single 138-kv circuit. Later, it may carry a second 138-kv circuit. And eventually, it will support a bundled-conductor 345-kv line.

At the ultimate voltage, as shown in the figures above, cost of the O-B suspension insulators will total less than 3% of the cost of the line, including right of way.

No component costs less - - yet none is more important to the overall performance of this line.

For the purchaser of suspension insulators, this fact has a double-edged significance.

First, it means that the *overall cost* of a transmission line *cannot be materially reduced* by cut-rate prices on a component that accounts for only 3% of the overall cost.

Second - - and more important - - it means that *overall performance* of the line *can be materially reduced* by the cut-rate quality that usually accompanies cut-rate price.

Nowhere, in other words, do "penny savings" entail greater "dollar risks."

Your O-B representative has convincing proof of this in the form of a 25-minute sound-color film entitled, "The Second 50 Million."

Why not ask him to arrange a showing in your office?

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10085-H

WEATHER *saps the life from ordinary rubber—but not DuPont neoprene*

These two outdoor test samples of cable have been constantly exposed to sun, rain, snow, ozone and industrial fumes—for over 25 years. The ravages of weather show clearly in the ordinary rubber jacket . . . badly cracked and embrittled. But the neoprene jacket is virtually as good as the day it was made . . . still smooth surfaced, tough and resilient.

In addition to this time-proven weather resistance, neoprene offers you many more protective qualities. Neoprene jacketing is flame resistant, oil resistant, impact and abrasion resistant. It can withstand line overloads without "flow," resists permanent deformation under load, and remains flexible down to −65° F. In short, neoprene has the best combination of properties available in a jacketing material. For more information write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-6, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

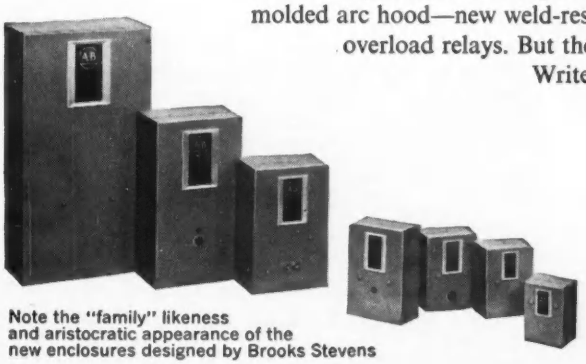
NEOPRENE
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*

a complete NEW family of Bulletin 709 Motor Starters

the greatest advance in motor control in 30 years

From their amazing compactness to their almost unbelievable operating life—measured in *millions* of operations—this entire family of Bulletin 709 solenoid starters is *new in every detail.* They feature a new, patented, high-efficiency magnet—new molded coil—new hot molded arc hood—new weld-resistant contacts—and new truly *trip-free* and *tamperproof* overload relays. But these new starters use the old Bulletin 709 heater elements. Write today for all the details on this really amazing new line of Allen-Bradley Bulletin 709 motor starters.



Note the "family" likeness and aristocratic appearance of the new enclosures designed by Brooks Stevens

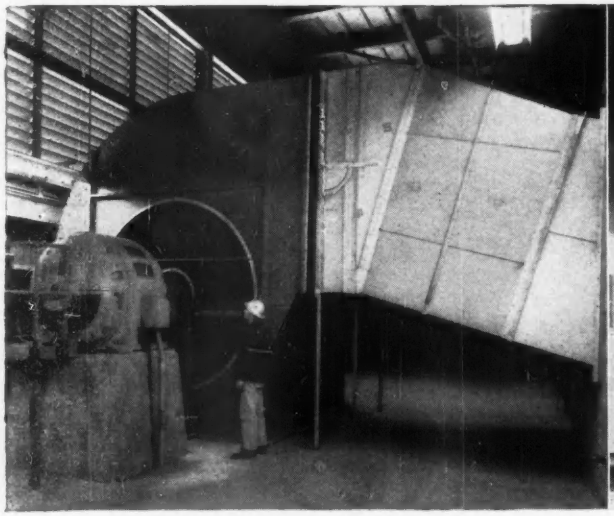
ALLEN-BRADLEY

Member of NEMA

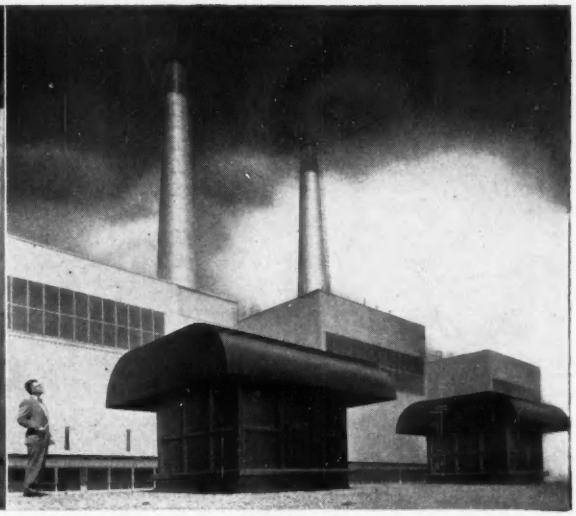
Quality Motor Control

Allen-Bradley Co., 1327 S. First St., Milwaukee 4, Wis.

How do you plan to ventilate and heat your power plant?



WITH CENTRIFUGAL FANS?



WITH POWER ROOF VENTILATORS?

Both methods have their advantages. The type fan you select will naturally depend on the circumstances encountered in the layout of your station. To meet these requirements, "Buffalo" offers power roof ventilators, centrifugal fans and make-up air units well suited to the task. Above are two typical "Buffalo" boiler room and turbine room ventilation installations.

"Buffalo" Centrifugal Fans — These quiet, efficient, non-overloading fans have proved an excellent choice for boiler house ventilation. If desired, hot air may be ducted to other areas as needed. "Buffalo" Centrifugal Fans provide completely stable performance from free delivery to shutoff. Turbulence is reduced to a minimum by unique "Buffalo" design features. All wheels are factory-balanced to minimize vibration. Rugged construction throughout gives a long life of trouble-free service. Write for full details in Bulletins F-104 and F-201.

"Buffalo" Power Roof Ventilators — These dependable "packages" exhaust high volumes of hot air from large areas. They save money from the start, because little, if any, expensive duct work is required. Peak-efficiency "Buffalo" fans insure minimum operating costs. Installation does not interfere with valuable floor space. "Buffalo" Sky-Vent Power Roof Ventilators are complete units, quickly and easily installed. Capacities 1,000 to 250,000 CFM. Assembled packages include fan, motor, housing, roof curbing, stack and hood. Can also be arranged for supply with heating coils and dampers. Write for Bulletin FM-2345.

Your nearby "Buffalo" engineering representative will be glad to work with you on your boiler room ventilation problems. Phone him today, or write us direct.

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

The facts about transistorized 2-way radio

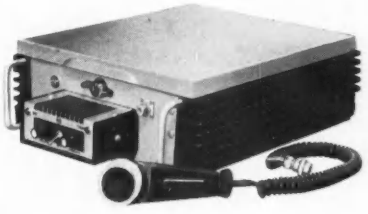
(FROM THE LEADER IN RADIO—RCA)

If you're cautious about specifying transistorized 2-way radio for your business . . . if you don't have full facts on the newest developments in radio communications equipment . . . you'll want to read this "Best Seller" by RCA. It's a fact-filled booklet that delves inside the "LD" (Low battery Drain) Mobile Radio; shows you why the "LD" gives you all the advantages of transistorization at a price comparable to all-tube equipment. Transistorized—yet easily serviced. Miserly in power consumption—yet generous in performance.

Check These Important Sections:

- How 2-Way Radio Finds "Hidden" Profits
- Inside Story on the "LD"
- Why Transistors?
- Nationwide Servicing

Read all about 2-way radio. You'll see why the new "LD" is today's best buy! Send coupon for your copy of this informative booklet.



RCA®

The Most Trusted Name in Radio

RADIO CORPORATION OF AMERICA

RADIO CORPORATION OF AMERICA
Telecommunication Center, Dept. WB-45
Meadow Lands, Pa.

☐ Please send me FREE BOOKLET on the new "LD" Mobile Radio.

☐ Have RCA Communications Specialist contact me to discuss today's best value in 2-way radio.

NAME_____ TITLE_____

COMPANY OR ORG._____

ADDRESS_____ PHONE_____

CITY_____ COUNTY_____ ZONE_____ STATE_____

TURBINES:

Shell reveals three ways that Turbo Oils help prevent oil breakdown, rust, sludge and foaming

Small quantities of air and water can work their way into any turbine lubrication system. These contaminants can accelerate oxidation of the oil.

Read how Shell scientists developed a specific formulation that counters this oxidation and brings you turbine lubricating oils with top performance records.

WHEN oxygen attacks turbine oil, it can form peroxides and organic acids. A chain of oxidation reactions begins. If the oil stability is inadequate, sludge can form.

Air entrained in the oil can aggravate oxidation. And it may cause foaming.

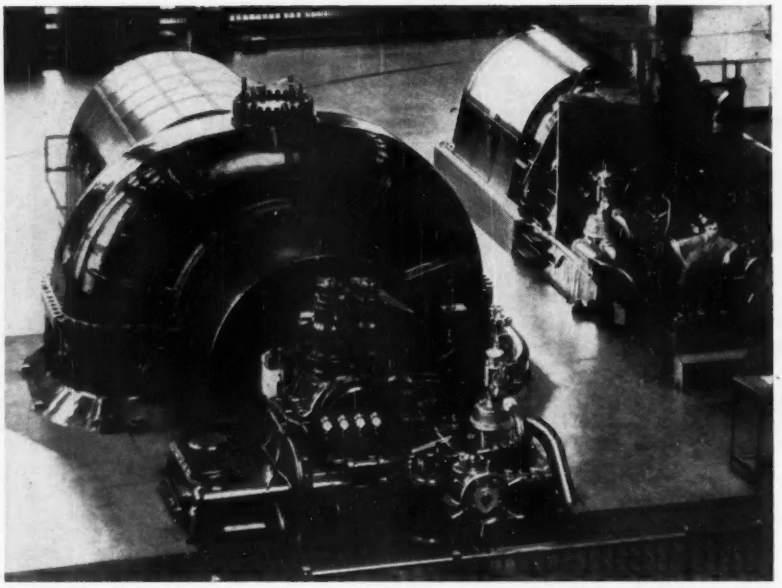
The oil may also be affected by water in the system. Laboratory tests have shown that water can greatly accelerate an oxidation process.

With Shell Turbo® Oil, Shell tackles these problems in three key ways:

1. *Shell carefully selects base oils for use as turbine lubricants,* then refines them to get the most effective response to Shell's special additives.

2. *Shell adds a powerful oxidation inhibitor to its precisely refined base oils.* This inhibitor helps prevent the chain of oxidation reactions caused by oxygen exposure at operating temperatures. It helps keep the oil in good condition, and lengthens its service life.

The result is that Shell Turbo Oils have proved themselves unusually stable over long service periods.



Shell Turbo Oils lubricate turbines with total rating of more than 17 million kw in the U. S. and Canada.

3. *Shell uses an outstanding rust inhibitor.* As a protective measure, Shell uses special additives that cover metallic surfaces with strongly adherent polar-type films.

These films are specially designed to help keep water from the metal surface.

In drastically accelerated laboratory tests, metals immersed in Shell Turbo Oils show outstanding anti-rust performance—even in the presence of sea water.

Ask your Shell Industrial Products Representative for facts on Shell Turbo Oils. Or write: Shell Oil Company, 50 West 50th Street, New York 20, New York.

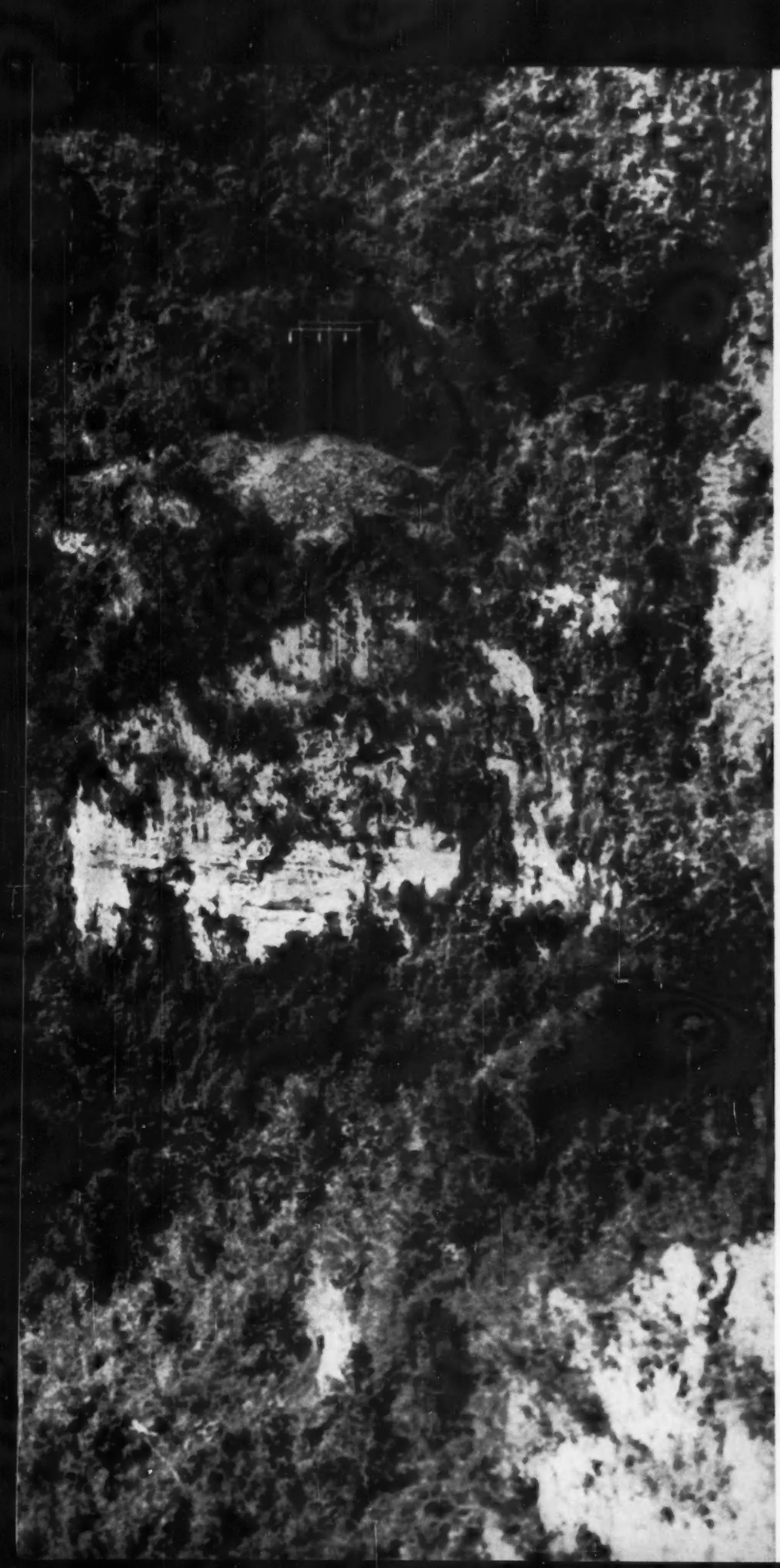
Memo to utilities

Ten turbines in the U.S. have been running on Shell Turbo Oil 27 *since 1938.*

In Canada, Shell Turbo Oils lubricate turbines generating more than half of all steam power produced.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry



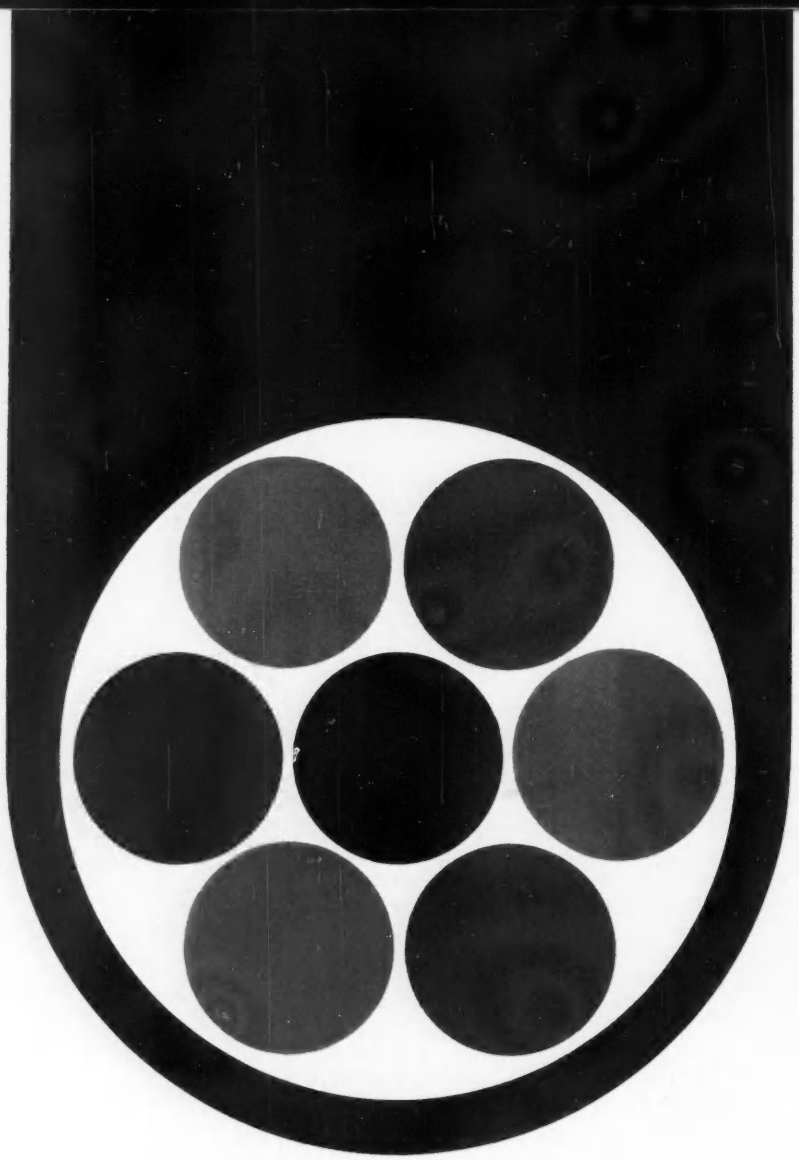
The mountains were surrounded by armies of trees and the poles had to be set on the peaks

For the past two years, a Sikorsky helicopter has been used to hoist and truck transmission poles over the wilds of Puerto Rico instead of through them. No time was lost chopping through the woods. No bulldozing of roads. No heavy investment in road equipment and crews. Instead, the poles were lifted over the trees by a Sikorsky helicopter. That's what the Puerto Rico Water Resources Authority recently did. For example, a 7-mile line was completed by the helicopter in a bare nine weeks. In Puerto Rico, setting and stringing that line by conventional methods would normally take an estimated 78 weeks. And there were savings in dollars, too, with reduced operating expenses.

A Sikorsky helicopter can save time and money in difficult terrain. It can also eliminate the problem of clearing a right of way and building expensive access roads necessary for vehicles in any terrain. A Sikorsky representative will be glad to help you analyze your own operation to see if you can benefit from a helicopter. Why not write today on your letterhead?

Sikorsky Aircraft

Division of UNITED AIRCRAFT CORPORATION
Stratford, Connecticut

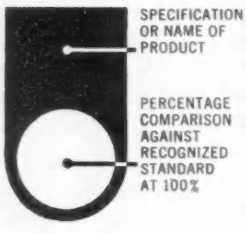


NEW WAY TO EVALUATE CABLE!

"VALUE RATINGS" RELATE PERFORMANCE TO IPCEA OR COMPETITIVE STANDARDS

New Value Ratings tell at a glance the composite story of each Kaiser Wire construction—as it performed in as many as 25 specified tests. In each case a well-known standard serves as 100%:

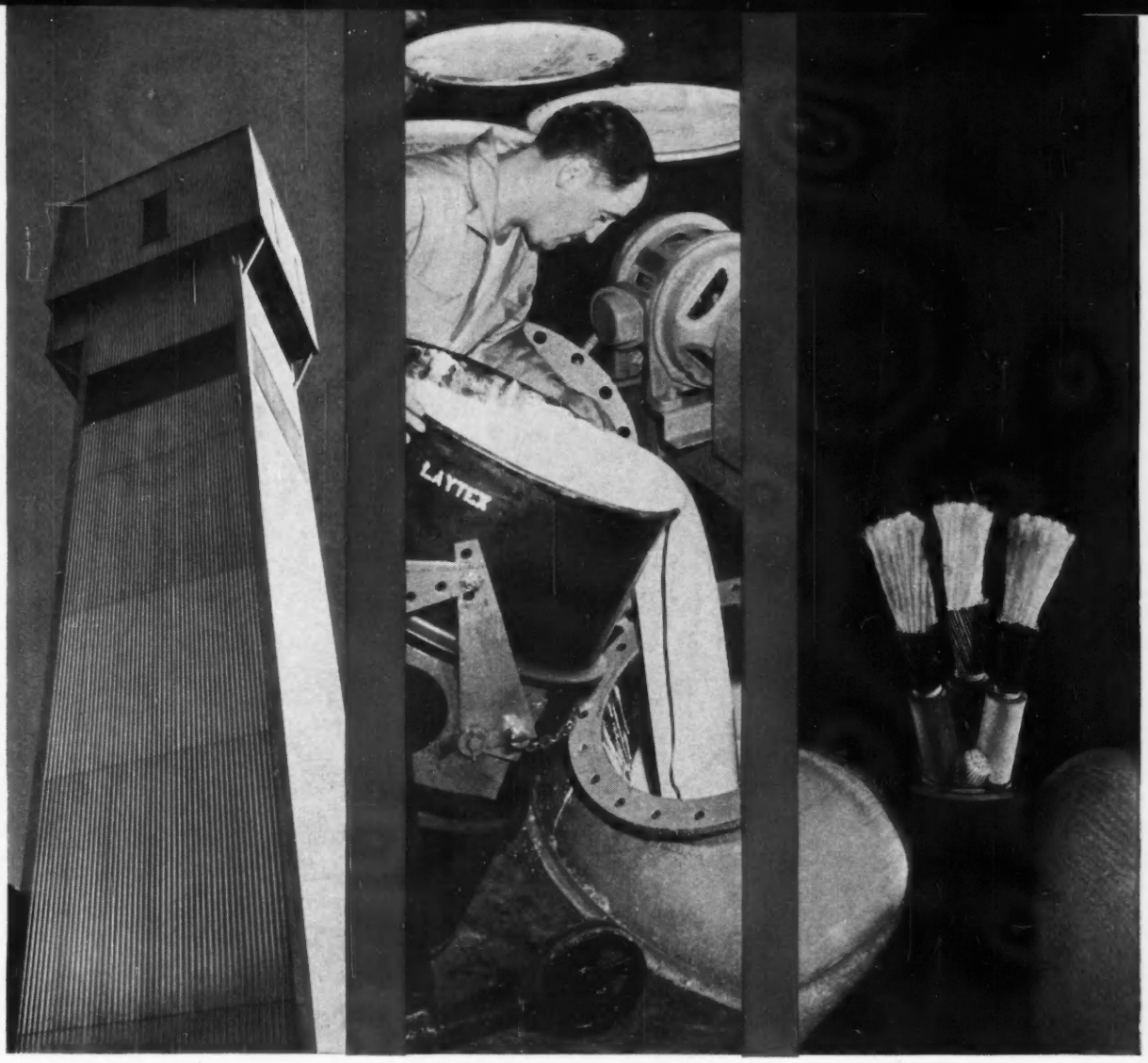
For power cable, the Value Rating standard is all IPCEA test requirements for types of insulation and jacketing specified . . . For portable cord, the standard is service-per-dollar for the least expensive cord (C.V.) as proved by life-expectancy tests. . . . For control cable, the standard is a composite of minimum requirements for eight important insulation qualities.



Compared to these standards, Kaiser Wire constructions earn Value Ratings as large as 767%—valid proof that the spark of quality is Kaiser Wire experience.

For details and Value Rating listings, ask your Kaiser Wire Distributor for free K/W Value Rating Bulletins, or write: Kaiser Wire, Room 844b, Kaiser Aluminum & Chemical Sales, Inc., Kaiser Center, 300 Lakeside Drive, Oakland 12, California.

KAISER ALUMINUM & CHEMICAL CORPORATION



WORLD'S MOST MODERN VERTICAL C.V. UNIT TOWERS OVER OTHERS

The world's most modern . . . tallest . . . and largest vertical continuous-vulcanization line operates in a 126-foot tower at Kaiser Wire's Bristol, R.I., plant. It turns out K/W power cables ranging from 600 V. to 15,000 V.—with conductors dead center regardless of thickness or weight. It is topped by a six-inch rubber extruder . . . ends with a new high-pressure water cooling system that increases insulation density and improves corona level in K/W power cables.

K/W GRIZZLY® POWER CABLE SPEC. 831
VALUE 270% RATING

MIRACLE OF LIQUID LATEX GUARDS KAISER LAYTEX® CONTROL CABLES

Coat after coat of liquid latex—applied in 100-foot vertical runs—gives K/W Laytex-insulated control cables unequalled value. The patented Laytex insulation process is the only one that applies virgin liquid rubber with its "liveliness" untouched by drying-regrinding cycles. Vertically applied concentric coatings eliminate any chance of weak, thin spots. Vulcanized Laytex has a remarkable insulation resistance constant of 75,000; typical tensile strength of 4,500 psi.

K/W LAYTEX-RESIN CONTROL CABLE
VALUE 767% RATING

KAISER FIBROUS CORE HELPS THIS CORD FLEX 12 TIMES LONGER

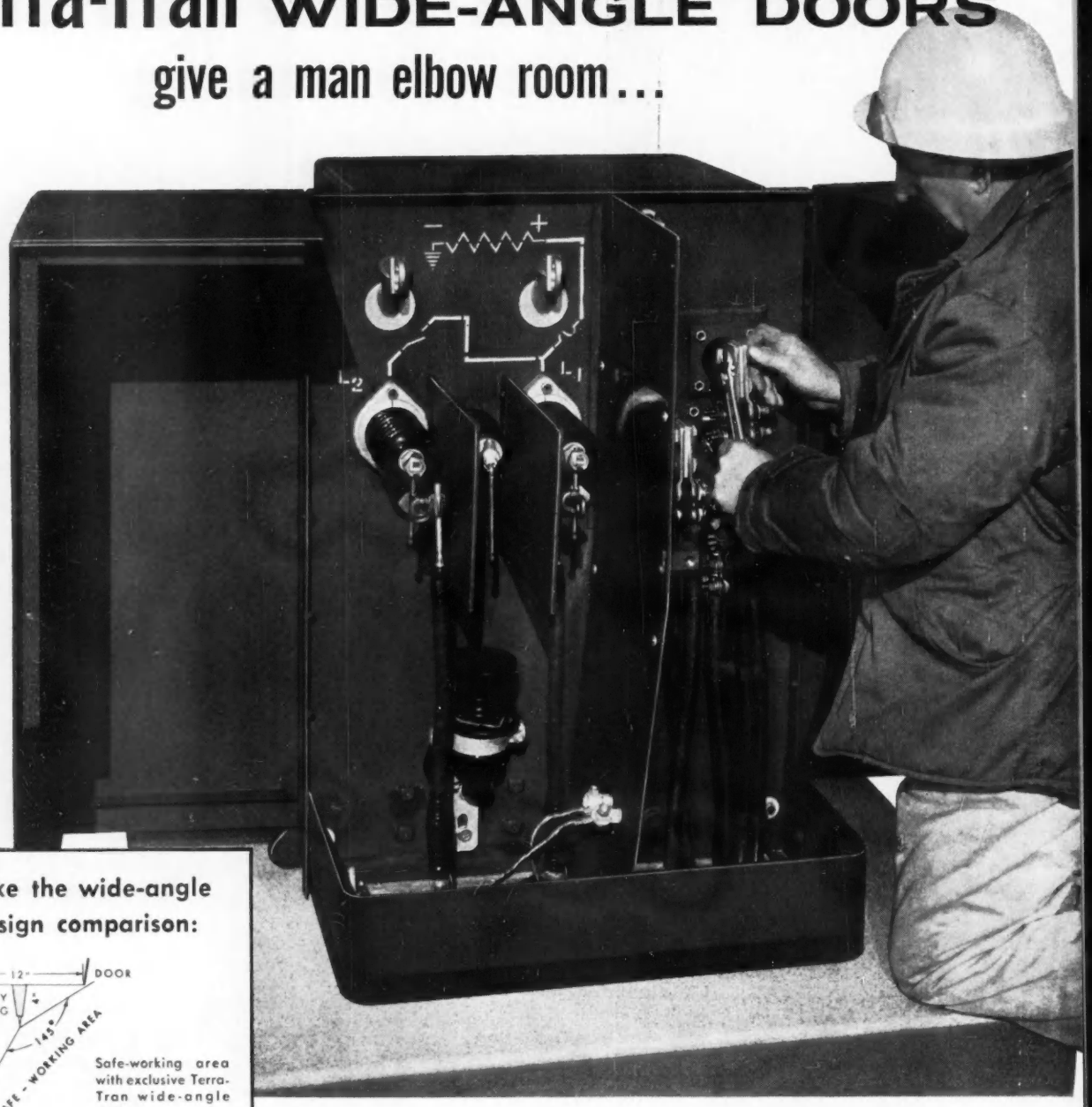
A patented "cushion" core of soft fibre —at the center of the twisted copper conductor itself — is one reason why K/W Master Laytex portable cord survived 1270% more flexing cycles than the average low-priced product (C.V.) . . . 488% more than high-grade mold-cured competitive cords. Flexing is one of eight qualities adding up to *five times greater life* for K/W Master Laytex cord. In service per dollar this means 308% as much value as low-priced C.V.

K/W MASTER LAYTEX PORTABLE CORD
VALUE 308% RATING

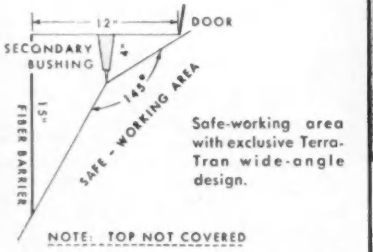
IN COPPER AND ALUMINUM CABLES... THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE! KAISER ALUMINUM

Terra-Tran® WIDE-ANGLE DOORS

give a man elbow room...

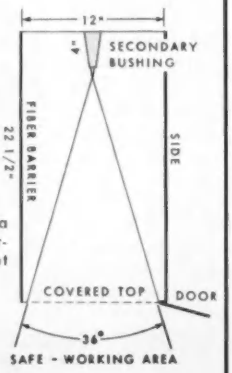


Make the wide-angle design comparison:



Safe-working area with exclusive Terra-Tran wide-angle design.

NOTE: TOP NOT COVERED



Safe-working area with typical separable compartment transformer.

RT&E Terra-Tran doors have 145° wide-angle design... 4 times more safe-working area for servicemen. Up-front, less than 12 inches away, primary and secondary terminations are within easy reach... no top or sides to box in the working area. In the Terra-Tran wide-angle design as many as 36 secondary leads can be hooked up with greater ease and safety because servicemen are not hampered by limited, tight, working space.

Changeout with Terra-Tran is simpler ... remove only 4 mounting bolts and slide away smaller Terra-Tran — slide in the new with the doors wide open. Remember Terra-Trans weigh much less, too.

RT&E builds a world of safety in the Terra-Tran

Only RT&E Terra-Trans have:

- 145° wide-angle door design
- 4 times more safe-working area
- No top or sides to hamper servicemen
- Up-front primary and secondary terminations within easy reach

Ask your RT&E Sales Representative for details or write for Bulletin 100 today.

RT&E CORPORATION

Waukesha, Wisconsin
Portland, Oregon
Arlington, Texas

Editorial Comment

JUNE 12, 1961

Manufacturers Present Their Price Story

This week (p 75) and last (p 83) *Electrical World* presents the broad outline of a story on electrical equipment value and price trends which four large manufacturers recently have carried to their customers. It covers the period 1937-58 for equipment values and 1954-59 for price trends. This is a story of industry averages; the manufacturers say unequivocally it is meant to apply specifically to no one utility.

A number of electrical equipment manufacturers now facing allegations of overcharging for their products have said publicly, in effect: We believe our customers weren't overcharged or damaged. The value and price story reveals basically why they feel comfortable in such broad generalizations.

The price trend presentation, carefully documented and audited by independent accounting, research and economic organizations, attempts to show that the trend lines for electrical and heavy steam equipment prices over the period in question weren't far different from those of labor and non-electrical equipment procured by utilities; and, that electrical equipment manufacturers' labor and materials cost trends also can rationalize their product price patterns.

Many will question the presentation method, the breakdowns utilized, or the index bases. But to criticize too specifically would be missing the point.

To the manufacturers, it evidently has given assurance that their customers have received fair value. To each individual customer, it can provide a starting point for his study into whether he has indeed been damaged; alternately, it provides additional check points against his studies already underway.

We are sure the customers will interpret this presentation in the light of their individual purchasing experience.

Secrecy Cloaks Generation-Transmission Loans

Millions in public funds are loaned each year by the Rural Electrification Administration under a cloak of secrecy so complete that the public has no knowledge of amount or detail until the loan is an accomplished fact.

We submit that this practice can provide a convenient block to objective examination—which might reveal, for example, that the public would be better served by some other avenue than a loan to a generation-and-transmission co-op. If nothing else, the practice—quite permissible under REA administrative regulations—demonstrates a flagrant disregard for the rights of the citizenery to know the uses to which its funds are put.

This secrecy did not originate with the new Administration. But it takes on new meaning under the third criterion for REA G&T loans introduced by the New Frontier. Until now, these loans couldn't be made when adequate, dependable power sources were available and when rates offered could meet power costs of the borrowers under facilities made possible by the loan. Now, the REA Administrator says he'll make a G&T loan if only he's satisfied that the cooperative principle is threatened. Secrecy is made to order for this new criterion.

Certainly, existing power suppliers should have the right to present testimony as to how they could meet a co-op's needs before a loan is approved. Determining economic and engineering feasibility of generation and transmission is complex. To rule on these matters, much less to decide whether the "cooperative principle is threatened," without considering opinions and bona fide offers by all concerned is dangerously arbitrary.

It is true that legal procedures can be used to get information on a loan application. But this is worthless when one doesn't know an application exists.

Secrecy in government, when national defense is not involved, is dangerous. In this case, it should be stopped at once.

Industry Looks at Nuclear Fuel

Utility executives across the country applauded the decision by the Atomic Energy Commission to reduce the price of uranium July 1. In talks with a score of utilities and the major nuclear power plant manufacturers, the AEC move was hailed as "a step in the right direction" to make nuclear power more competitive with conventional means.

The AEC price cuts, made on a sliding scale, varied from 20% for 90% enriched uranium to 34% for 1% enriched uranium (see box, opposite page). At the same time the AEC increased the use-charge rate from 4% to 4.75%. But, according to AEC Chairman Glenn T. Seaborg, the net effect of cutting the base price and raising the use charge "will be to lower the cost of nuclear power."

In addition, the AEC gave strong hints that it might modify its present buy-back price guarantee for plutonium and U-233 and also is considering a proposal to Congress to change present law and allow private industry to own enriched uranium instead of just leasing it from the AEC.

Savings Estimates Vary

Rough estimates as to net effect of the moves in terms of mills per/kwhr energy cost savings varied from 0.3 mills per/kwhr for a single-cycle 300-Mw boiling water reactor, according to a General Electric Co spokesman, to about 0.5 mills per/kwhr for the Yankee Atomic Electric Co 145-Mw pressurized water reactor, according to William Webster, president of the group.

This will amount to annual savings of from $400,000 to $600,000, Webster noted. But he also pointed out that Yankee, because of an AEC waiver, pays no use-charges for the first five years. Without the use-charge waiver, he explained, annual savings would have been roughly $100,000 less.

According to the AEC, there are only four civilian power reactors not taking advantage of the five-year waiver on fuel-use charges. These are Consolidated Edison's Indian Point plant, Commonwealth Edison's Dresden Station, Pacific Gas & Electric's Humboldt Bay plant, and General Electric's Vallecitos test reactor. These companies can say their entire operations were privately financed.

Total energy costs for nuclear power plants now vary from 7.3 mills to 15 mills per/kwhr or more, depending on the reactor type and other factors.

More and Bigger Change Needed

However, as a result of the small magnitude of indicated savings from the AEC move compared to total costs, there was general agreement that the price cuts were no more than a "step" and that more sweeping changes would be needed before nuclear power forged ahead.

But here there were varying shades of opinion. A GE spokesman said he hoped the July 1 price cuts would be enough to cause "several customers" who are "sitting on the edges of their chairs" to sign contracts.

But another industry observer said that he thought other problems, such as siting and safety, far outweighed the effects of the price cuts, and that these cuts would not change the atomic power picture appreciably.

However, General Electric's Francis McCune disagreed on siting and safety. These problems, he noted, are more transitory and vary with public opinion. As for the price cuts, these make atomic plants which are already competitive even more so, he said, and noted that the new price of uranium in the US is bringing the cost of nuclear fuel in line with the world market (assuming 14% fixed charges).

A Consolidated Edison Co spokesman was less optimistic. He said that after studying the price changes in a general way, he believed that they would have relatively little effect on economics or planning.

But Webster of Yankee characterized the move as a "real step" in making atomic power even more competitive in high fossil-fuel cost areas, such as New England.

And an AEC official in Washington added, "Anybody who says this is not an important step forward for nuclear power is just blowing smoke."

As to the precise savings of the uranium price cuts on varying reactor concepts, no information was available at midweek. Utilities and manufacturers were busy making computations on costs using the new prices. The picture was further complicated by the higher price cuts on the low end of the enrichment spectrum. New optimizations of designs might be called for. There was some belief that reactor concepts using low enrichments were more favored by the AEC moves.

Arthur Griswold, vice president, Detroit Edison Co, said "considerable study" would be required before the effect on highly enriched reactors could be determined. Detroit Edison is building a fast breeder reactor that uses relatively high-enrichment uranium.

In Chicago, Commonwealth Edison said it hadn't yet computed the net effect of the price reductions on Dresden because, "right now we're more interested in getting Dresden back on the line—which should occur in a few days."

For the AEC's Shippingport reactor, which sells steam under contract to Duquesne Light Co at 8 mills per kwhr, there is no formal re-opener in the contract, as such, for uranium fuel price changes. However, the contract is now being renegotiated to cover steam from the second core when it is installed.

Price Cuts Effective July 1

The new base charges for enriched and depleted uranium (also cut in price), were published in full in Federal Register on May 30, 1961. They will apply (after July 1) to material leased or sold under domestic and foreign arrangements, and now under lease, where appropriate.

AEC says the reduction in base charges was made possible by decreases in the cost of natural uranium. The new charges correspond to a price of $8 per/lb of uranium oxide in natural uranium concentrates. This price has been established by the Commission under its domestic purchase program for

Price Cut

April 1, 1962 to December 31, 1966. Under existing agreements, the price has been about $10 per lb. The component of the base charges representing the work of separating uranium isotopes from natural uranium remains the same.

No change has been made in the price which the government will pay for plutonium and U-233 produced in licensed reactors. These prices have been guaranteed by the AEC through June 30, 1963. But the Commission has no commitment as to what it will pay for plutonium and U-233 after this date. Said AEC, "No such commitment is implied or intended by the use of estimated or assumed fuel values in AEC studies of future costs of nuclear power. As nuclear power becomes more nearly economically competitive with other sources of power, it will be desirable to move toward prices of plutonium and U-233 which are determined by normal market factors of supply and demand."

In addition to the price cut, the Commission says it is considering the desirability of amendments to the Atomic Energy Act to eliminate the statutory requirement for government ownership of special nuclear material. Such an amendment would give full consideration to the "primary and essential aspects of maintaining effective international safeguards under civil agreements for cooperation with other countries, under the International Atomic Energy Agency, and under disarmament proposals." It would also be necessary, according to AEC, for the government to control special nuclear material within the US.

The Commission is considering transition measures that might be necessary if a change were made from government to private ownership of nuclear material. For example, if the requirement of government ownership of plutonium were to be terminated, the AEC says it might well find it advisable to announce its willingness to buy these materials produced in privately owned facilities at their fuel value for a few years until a free market could be established.

Changes in Fuel Costs

The changes the AEC is making in its fuel price and rate schedules affect only a portion of total fuel cycle costs, and a much smaller portion of total over-all costs. Using 1959 AEC figures for a 300-Mw pressurized water reactor, these costs (in mills/kwhr) might total 9.28, of which 5.05 is for fixed charges, 0.59 for operation & maintenance, 0.26 for insurance, and 3.38 for the fuel cycle.

This fuel cycle in turn is broken up into the following segments (in mills/kwhr): fabrication, 1.25; shipping 0.18; depletion (or price of uranium actually consumed), 1.81; reprocessing, 0.42; plutonium credit, minus 0.96; use charge (or rental fee for use of enriched uranium), 0.49; and use of fabrication capital, 0.19.

The AEC changes affect only two of these fuel cycle cost segments: depletion and use charge. Depletion cost is figured by taking the difference in prices for the different enrichments before and after burnup. For the PWR mentioned above, rough calculations show savings under the new prices might be around 0.4 mills/kwhr. Use charge is figured by applying the annual rate (to be changed from 4% to 4.75% July 1) to the value of the uranium in the core. For the PWR above, the net effect of lowering the base and raising the rate might be a use-charge reduction of about 0.05 mills/kwhr. Total fuel cycle savings would then be a little under 0.5 mills/kwhr for this example. Considerable variance can be expected in other reactors.

Below are samples of the new uranium hexafluoride prices as announced by the AEC:

U-235 Assay in Weight Per cent	NEW CHARGES: Dollars per Kilogram of Contained Uranium (Official Base Charges)	NEW CHARGES: Dollars per Gram of Contained U-235	PREVIOUS CHARGES: Dollars per Gram of Contained U-235	Per cent Reduction
ENRICHED URANIUM				
90	12,285.00	13.65	17.07	20
20	2,547.00	12.74	16.12	21
10	1,195.50	11.95	15.29	22
5	535.50	10.71	13.96	23
3	281.20	9.37	12.52	25
2	160.00	8.00	11.00	27
1.5	102.60	6.84	9.70	29
1.0	49.90	4.99	7.58	34
DEPLETED URANIUM				
0.7	22.60	3.23	5.45	41
0.6	14.80	2.47	4.48	45
0.5	8.05	1.61	3.33	51
0.4	3.00	0.75	2.04	63

If a user specifies a U-235 assay between 0.4 and 0.22 weight per cent, the charge will be $3 per kilogram of contained uranium. However, if the U-235 assay is not specified by the user, the AEC will supply uranium having a U-235 assay to be determined by the AEC in the range below 0.4 per cent and will charge $2.50 per kilogram of uranium.

Clapp Stresses G&T Loans

Rural Electrification Administrator Norman Clapp last week pushed harder to establish a "new criterion" for granting REA loans to rural electric systems to build their own generating facilities.

"We intend to use our G&T loan authority at REA whenever our borrowers are unable to obtain the security they need through power contracts," Clapp told the annual meeting of Dairyland Power Co-op, in LaCrosse, Wis. "The terms and conditions under which our cooperative rural systems can generate their own power thus become a new yardstick—a yardstick of freedom—by which every wholesale power contract in the country can be measured."

Clapp said that he plans to set up a new power supply division in REA to handle these G&T loan applications. "This new division will concern itself with all matters affecting the development of adequate and reasonably priced power supplies for our borrowers, and its staff will deal directly with generation and transmission borrowers and loan applicants. It will be a sort of mobile task force, small, expert, and ready to turn its attention to any trouble spot on our REA power supply map."

Territorial integrity also will get more attention from REA, Clapp told a meeting of Idaho, Oregon and Washington borrowers last week in McCall, Idaho. "For REA's part, I am proposing to meet the rural electrification leaders in a series of statewide conferences on territorial integrity in the hope that we can help map out a unified approach to protect the interests of our borrowers. I am ready to go to any state where REA borrowers will agree to get together and work on a common program for their mutual protection . . . REA is prepared to offer the full measure of its resources to assist its borrowers in every state where help is needed."

Committee Votes $195 Million

Meanwhile, a fiscal 1962 appropriation of $195-million for REA's electrification loans was approved by the House Appropriations Committee. This is precisely the figure requested by President Kennedy in his revised budget message to Congress, but its makeup is considerably different from what he requested.

Kennedy had asked for all $195-million to be in direct loan funds, available as needed. Instead, the House Committee split the $195-million into two blocks: $125-million in direct loan funds, another $70-million to be held in a special contingency reserve. The reserve funds can be made available for REA loans, but there's a psychological and bureaucratic hump to go over in getting them. REA never has used its reserve funds before for electrification loans, although it has used them for telephone loans.

Actually, the $125 million in direct loan funds, approved by the Committee, is only $10 million higher than what the original Eisenhower budget had requested. Eisenhower also had asked for a $30-million contingency, and the Committee raised this to a $70-million contingency.

Penelec Receives Edison Award

Sherman R. Knapp (left), president of Edison Electric Institute, presents the Edison Award to Louis H. Roddis (right), president of Pennsylvania Electric Co. Albert F. Tegen, president of General Public Utilities, parent company of Penelec, looks on.

The award went to Penelec "for developing the engineering concept and pioneering in the design and actual construction of America's first 460-kv transmission line operating as a major component of an integrated power network." The line is equipped to operate at 500 kv, and has already operated above this level.

Presentation was made at the EEI convention in New York.

Cordiner Testifies Before Kefauver Committee

Ralph J. Cordiner, chairman and president of General Electric Co, emerged unscathed from his day before Sen Estes Kefauver's (D-Tenn.) Senate Antitrust and Monopoly Subcommittee.

Cordiner said he deeply regretted GE's involvement and termed violations of the antitrust laws unethical, immoral and bad business. But he said he believed that no executive of a large company could make a 100% guarantee that such violations are not taking place because "you're dealing with people, with human beings."

Tacit support for Cordiner's position came from Commerce Secretary Luther Hodges. Hodges told the committee that while the problem was "not a question of bigness or smallness," large companies have "special problems and here, I believe, is perhaps one of its great failures—it is a failure in communication." This position is much the same as Cordiner's.

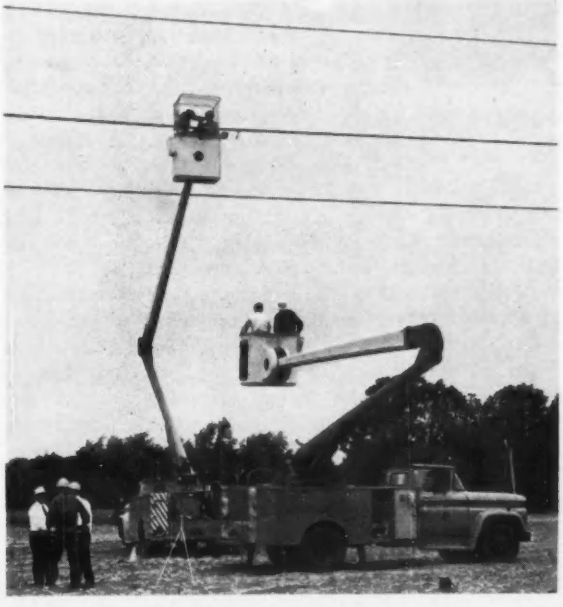
While Cordiner readily admitted that GE was not proud of its record of antitrust violations, he would not agree with Sen Kefauver that the company's record amounted to a corporate disgrace. "I am deeply grieved and concerned about it," Cordiner said, "and we are trying to do something about it. But I will not be responsive and acquiesce in your suggestion of 'corporate disgrace.' " Cordiner reminded Sen Kefauver that he himself had earlier praised GE's contributions to the nation's welfare, ". . . too many contributions," said Cordiner, ". . . for me to concede we deserve such an indictment."

Sen Kefauver and Cordiner engaged in an extensive discussion of identical bidding on electrical equipment. Kefauver said he could not understand how public buyers could make secret bidding effective if companies simply submitted the same bids on standard pieces of equipment. Cordiner replied that the sealed bid business represented only about 3% of GE's total sales and about 6% of its apparatus business. "It would indeed be unrealistic to quote lower than catalog price on 6% of the business and expect to obtain higher price from all other buyers on 94% of the business," he said.

Later, while discussing identical bidding with Kefauver, Cordiner said that last February General Electric reduced its price on watthour meters by 30 cents, and "within a few days everybody met that price."

CORDINER

Cordiner said he thought executives who took part in the illegal activities might have been motivated by two things: the desire to become "Mr. Transformer" or "Mr. Switchgear"—an important power in an industry—and also the urge to do business in a "lazy" fashion. He stressed that he believed an effective program of education would be the best way to eliminate illegal activities and said that only in this manner would the importance of obeying antitrust laws be put across to individuals.



Live 345-Kv Worked Bare

Linemen of Indiana & Michigan Electric Co became the first to work a live 345-kv line with their bare hands. The work was done on I & M's Breed-Olive line south of Montmorenci, Ind. I & M is an operating subsidiary of American Electric Power.

The two linesmen installed an aluminum sleeve on a damaged line in an hour while the line remained in service. Prior to development of the bare hands technique, the line repair job would have taken 25 manhours, and the line would have had to be removed from service.

The I & M linemen worked in a Fiberglas bucket lined with a metal mesh, and insulated from ground. The mesh was connected to the conductor, and was energized, along with the linemen, to the same voltage as the cable. Thus the technique used the principle that current doesn't flow when there is no difference in voltage between two points.

According to the linemen, there was "no sensation whatever."

Bonneville Submits 'Export' Plan

Bonneville Power Administration has released its first, detailed proposal of how the Pacific Northwest might have its markets "protected" in the event a large transmission line were built to export Bonneville power to outside markets—notably, California.

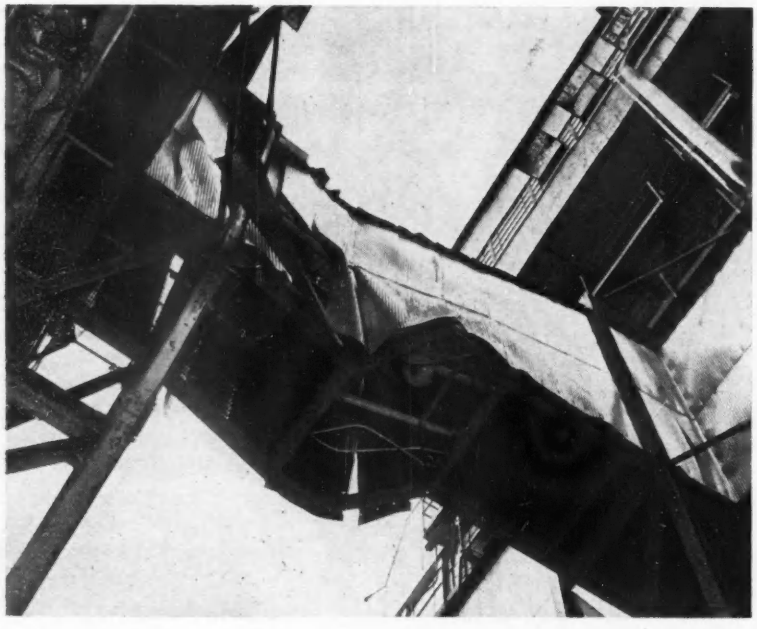
The Bonneville proposal has been drafted in the form of a bill to be introduced in Congress.

A new, definite, Administration-backed bill may go to Congress this fall. In the meantime, Bonneville is awaiting comments from its preference, industrial and utility customers on the proposal, as well as awaiting comments from various states and interested federal agencies.

Bonneville's sales outside the Northwest would be only for secondary electric energy and peaking capacity in excess of its foreseeable requirements within the Northwest. Contracts for sale of energy outside the Northwest would include a seven-day pull-back clause. Contracts for peaking capacity outside the Northwest would require a 42-month termination clause, plus the purchaser being required to return during his own off-peak periods energy to supply the peaking capacity. Conservable hydro power, not immediately needed in the Northwest, could be sold outside the Northwest on the requirement that the full amount of energy must be returned—or any portions thereof—during the purchaser's off-peak period.

The Secretary of Interior could order power exchanges between Bonneville and another area over such an intertie "to the extent required to coordinate the operation of such generation facilities," if he finds them to be "in the interests of the United States and of each of the areas involved . . . all benefits, including increases in firm power resulting from coordinated operation, shall be shared equitably by the plans or systems involved."

The proposed bill would not be applicable to the U S—Canadian treaty for development of the Upper Columbia River.



Blast Rocks Unit at Arapahoe Station

Twisted steel catwalk connecting boilers 2 and 3 shows the force of the explosion that rocked the number three boiler at Public Service Co of Colorado's Arapahoe station. The explosion occurred late last month while the 44-Mw unit was being put into operation under controlled startup procedures. Preliminary investigation indicated the blast resulted from delayed ignition of accumulated gasses in the boiler.

A two-alarm fire resulted when an 8-in. natural gas fuel line fed at about 30-lb pressure was ruptured by the explosion forming a giant blow torch. Plant personnel moved in and closed the valve despite flames roaring 20 ft into the air. Service was not interrupted although it was temporarily necessary to dump No. 2 unit Arapahoe's No. 1, 2, and 4 units were operating at full capacity less than two hours after the explosion.

Damage to the boiler was extensive. It will be at least two and a half months before the unit will be back on the line. There were no injuries to plant personnel.

Con Ed and Union Accused Of Bias Against Negroes

Witnesses before the House Committee on Education and Labor have accused Consolidated Edison Co and the union representing its 20,000 employees of discriminating against Negroes. One witness testified, "Negroes are restricted to the most menial jobs at Con Edison—mops, brooms, picks, shovels and jackhammers." Another witness called the union representing Con Ed employees, "Jim Crow and lily white from top to bottom."

Most of the testimony was leveled against the union. It was charged that "not a single Negro" held one of the 47 policy-making jobs in the union. Furthermore, if any Negro "dared oppose a fixed union slate," he would be committing economic and political suicide.

The company and the union will be given an opportunity to reply at later hearings; both deny the charges.

R/W Spraying, Power Trimming Cut Utility Costs

PANELISTS E. C. Duffy, Long Island Lighting, W. H. McElwain, Jersey Central P&L, and E. J. Thimme, Public Service E&G, await call of Moderator Dale Swanson, Asplundh

Chemical treatment of rights of way and mechanized trimming of trees have helped utilities hold the line against rising transmission and distribution costs, according to a panel of utility executives at the recent Asplundh Line Clearance Seminar at Willow Grove, Pa.

Experience has shown that programmed chemical treatment cuts the cost of maintaining transmission rights of way to 30% or less of the estimated cost of periodic cutting, said W. H. McElwain, Jersey Central and New Jersey Power & Light Cos. Records show that the high initial cost of chemical treatment is followed by a sharp drop in 2 to 4 years after control has been achieved. Thus the high initial cost can be charged to line investment, leaving modest subsequent charges against annual costs, he said.

Adoption of mechanized equipment for tree trimming —power saws and pruners, cranes for removing dead or dying trees, and aerial lifts to speed workmen into better working positions—has enabled line clearance contractors to do a better job at less total cost than was possible with manual methods, reported E. J. Thimme, Public Service Electric & Gas Co. The new approach, under improved supervision, has achieved better line clearance with excellent public relations in a growing territory. This program, together with simplification of plant design and adoption by the utility of efficient mechanical construction methods, has helped hold distribution costs in line, he said.

Constant pressure to get effective trimming at reasonable cost, and with a reasonable profit to the contractor, has enabled Long Island Lighting Co to hold trimming costs to $2 per year per residential customer, reported E. C. Duffy. But some part of this economy should be credited, he inferred, to excellent cooperation by property owners, nurserymen, and governmental agencies in LILCo's promotion of compact trees for the residential re-development of Long Island.

UTILITY EXPERTS SOAR in assorted aerial lifts, inspect variety of other mechanized aids and tools for tree trimming

Mechanization Proves Costly

In discussion, Carl Asplundh cautioned that mechanization will cost clearance contractors $5,000 per man as against manual equipment at $600 per man. Within five years, he predicted, 50% of the work will be done by two- and three-man crews using aerial lifts. Such a massive conversion could absorb all trimming-contract profits for the next five years, he said.

M. W. Ghen, Duquesne Light Co, suggested use of chemical brush control in conjunction with trimming for lines along rural roads. Selective application at bends, he said, has won favor by reducing traffic hazards.

A good line-clearance program is good for utility customers because it provides reasonable protection against service interruptions, said J. T. Wolfe, Baltimore Gas & Electric Co. It helps utility employees by protecting their jobs and enhancing their pride in the service their company gives. And it benefits stockholders by holding costs in line and generating needed good will in the service area. But its cost must always be scrutinized for possible savings in labor or material and more efficient use of investment, he said.

"It took three bad storms in seven years to teach us the gospel of adequate tree clearance," said Horace MacVaugh Jr, Philadelphia Electric Co. "We almost always prefer to remove . . . more often than not for less than three times . . . the actual cost of a thorough pruning job," because "a tree that isn't there can't cause a burndown." Where removal is impossible, pruning is the choice, he added, followed by new design for lines where pruning is denied. But the future holds two additional avenues of relief—wider acceptance of the "small shade tree program," and "development of hormone compounds to retard growth safely."

Field Tests Prove

Three-legged transmission tower uses special extruded aluminum leg shapes; weighs three-tenths as much as steel tower

E. JABOOLIAN, Project Engineer, Gibbs & Hill Inc, New York, N.Y.

A. F. SEDGWICK, Chief Electrical Engineer, The United Illuminating Co, New Haven, Conn.

J. MAPLES, Manager, Structural Fabrication Plant, Reynolds Metals Co, Phoenix, Ariz.

A three-legged aluminum tower for double-circuit 115-kv lines has been proved in field tests which simulated ice loading and broken wires. The design for this tangent tower has two unique features:

- Leg members in the cross-sectional shape of an M, a shape easily produced by the aluminum extrusion process.
- Three instead of four legs, making the tower body and cage an equilateral triangle.

The reduction of maintenance, lower labor costs in assembly, and reduction in number of foundations make these aluminum towers competitive with steel.

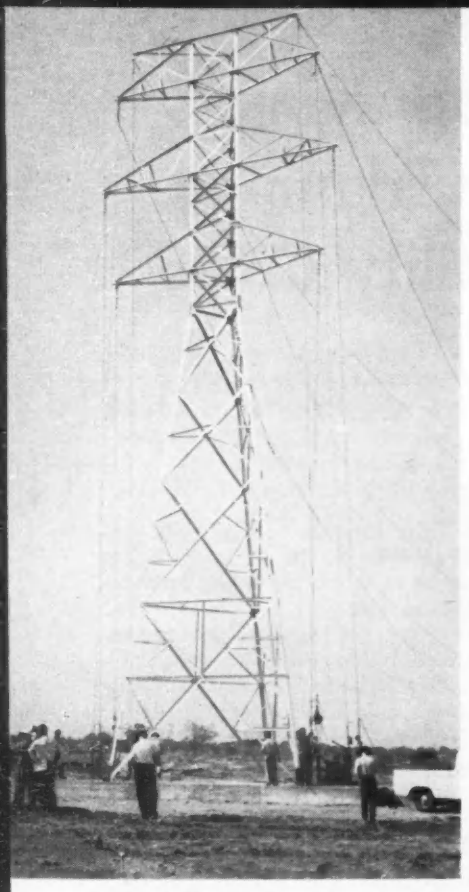
These aluminum, and some aluminum-top, steel-base towers, were installed in a line recently built by the United Illuminating Co. If conventional four-legged all-steel towers were instead used, the weight of each tower would have been about 13,800 lb. Replacement of the steel members of such a tower by aluminum members without benefit of special shapes results in a weight of aluminum tower of 4,600 lb. Special aluminum shapes and the use of only three legs yields a structure that has three-tenths the weight of a steel tower.

Tests to show the practicality of aluminum were conducted on a 94-ft, 115-kv suspension tower for tangents and line angles up to 2 deg, 15 min. The tower, entirely of 6061-T6 aluminum alloy, was designed for spans of 1,000 ft vertical and 815 ft transverse with conductors of 795 MCM, 45/7 ACSR with 183.8 MCM, 7 No. 6 Alumoweld ground wires.

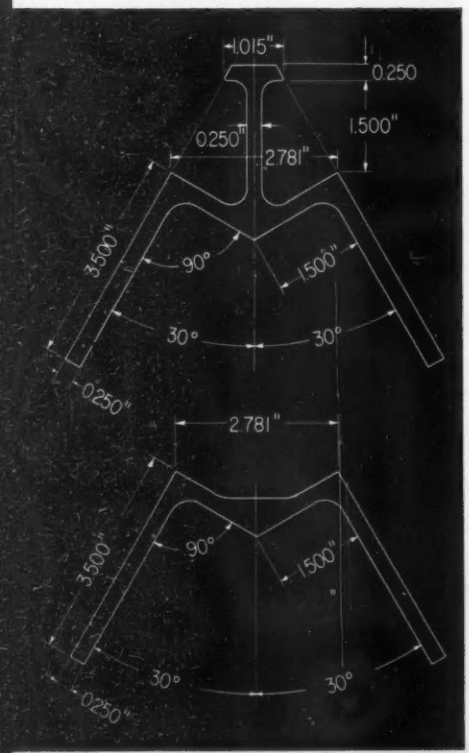
Field tests represented the following conditions:

1. Heavy vertical loads caused by the eight wires with 1½ in. of ice.

2. The resultant loads caused by

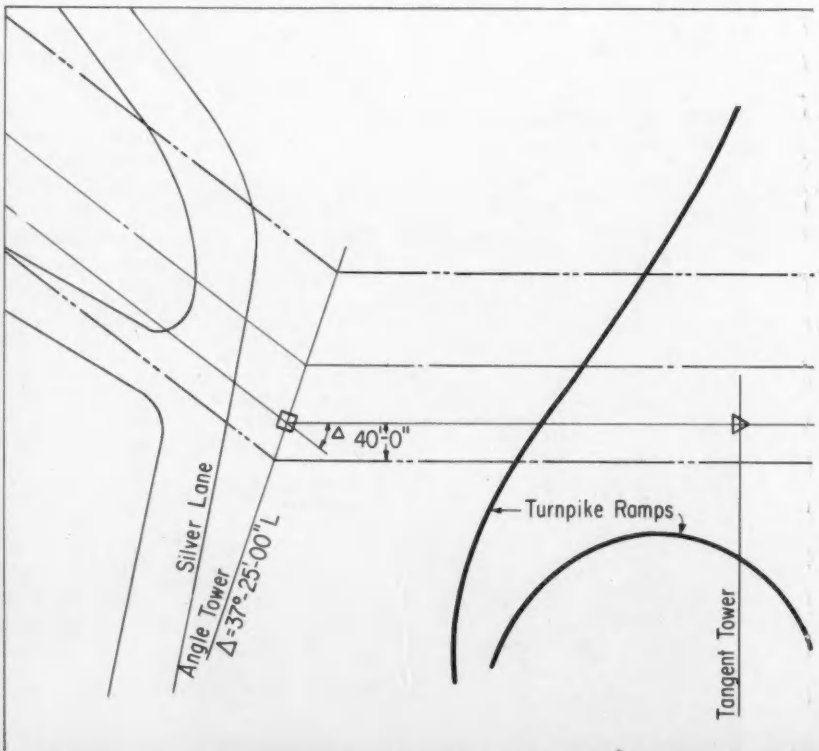


TRIANGULAR TOWER has 6-ft cage sides and 23-ft base sides; tower is set up in open field for broken wire and icing test



TWO LEGS use extruded aluminum shape shown on top while third leg uses bottom shape

THREE-LEGGED ALL-ALUMINUM and four legged steel-base and aluminum-top



New Aluminum Tower Design

two broken wires, transverse wind of 8 lb per sq ft on the wires, wind of 13 lb per sq ft on 1½ times the area of projected tower face, and the transverse load due to the line angle. Two separate tests were made of the broken wire condition.

Heavy weights were hung from all crossarms until the loading was slightly more than the weight of wires with 1½ in. of ice. With weights applied to each of the six crossarms in 1,000-lb increments up to 6,000 lb and to the two ground-wire supports up to 4,000 lb, the tower showed no visible deflection. A surveyor's transit found no excessive deflection.

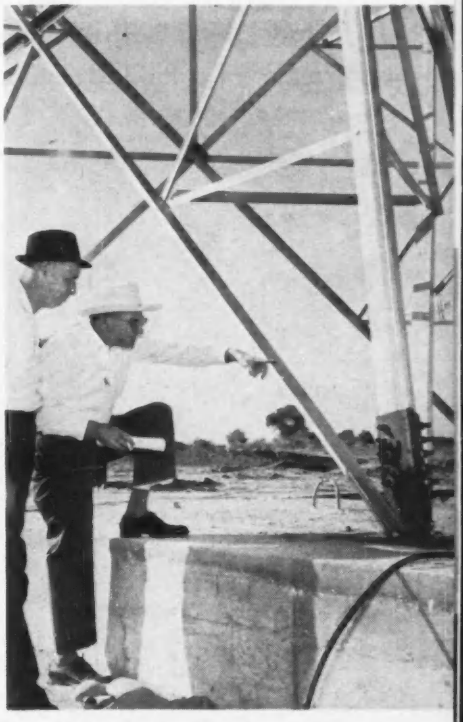
After completion of the tests for vertical strength, the loads on one side of the tower were released unevenly to simulate ice dropping from one side. This had no visible effect on the tower. After all loads were removed, the transit tests showed that the tower returned to the original position.

A test to simulate loading with the two upper conductors on the same side of the tower broken but with all other conductors intact stressed the lighter leg section. This time a 25% overload was applied, except for the broken conductor longitudinal load, where 117% of design load was applied.

To simplify testing, loads were applied representing the resultant of transverse, vertical and longitudinal components. On the ground-wire support, an applied load of 1,445 lb simulated a vertical load of 1,030 lb and a transverse load of 1,015 lb. On the upper conductor supports, an applied load of 3,700 lb simulated a transverse load of 710 lb, a vertical load of 1,045 lb and a tension in the conductor of 3,470 lb. On the other conductor supports, an applied load of 2,460 lb simulated a transverse load of 1,415 lb and a vertical load of 1,980 lb. The weight of the cable and jacking hoists were included in the applied loads.

Loads again applied in increments of 1,000 lb to overloads as mentioned caused no permanent deflection on the tower.

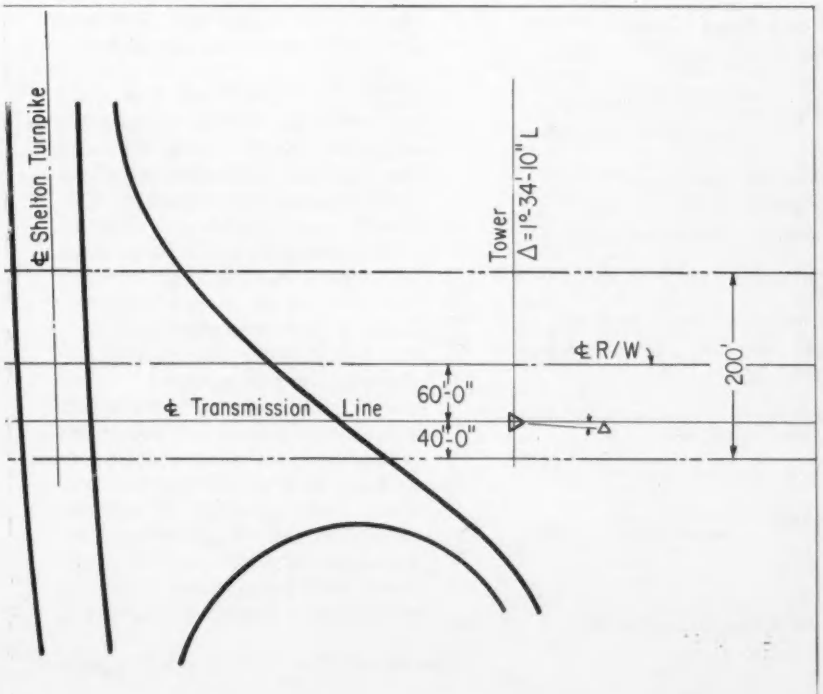
A test was then made to simulate middle and upper conductors broken on the same side of line with no restraint by intact cables. Stressing the lacing and middle crossarm, this test was applied to an overload of 25%, thus satisfying test requirements.

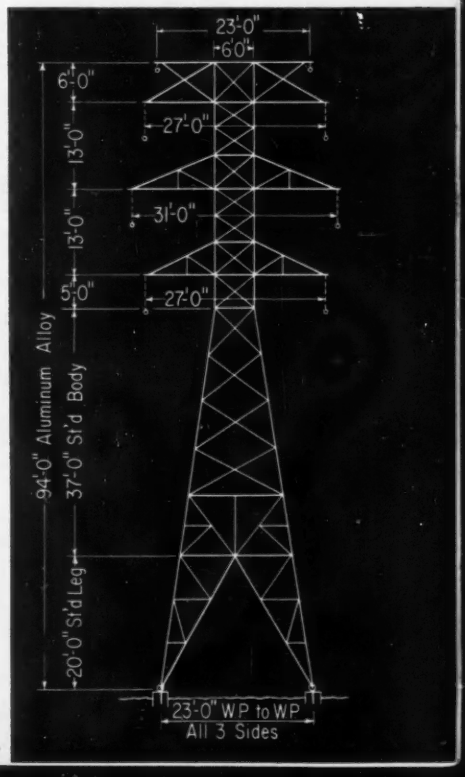


BOTTOM OF TOWER LEG is bolted to steel stub angle which is set in individual concrete pier foundation

ALL-ALUMINUM TOWER was used in line from The United Illuminating Co Bridgeport station to tie into existing Connecticut Light and Power Co lines

towers carry two 115-kv, 795 MCM ACSR circuits over turnpike cloverleaf





Experience Justifies Use of

Philadelphia Electric's all-aluminum substations are a product of a long evolution from the latticed steel designs of the 1920's through improved postwar steel designs to the present clean, safe efficient substation design

W. S. EINWECHTER, Supervising Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Experience with twelve all-aluminum substations on the Philadelphia Electric Co system has demonstrated that the present substation design very closely approaches the ultimate goal of maximum economy, reliability and safety attainable with today's materials. Present design reflects an evolution in station design, materials and construction techniques which has taken place in recent years.

The early design of high-tension substations used a double-bus arrangement with bolted copper conductors supported by continuous latticed box beam steel structures as illustrated in Fig 1. Designed and constructed in 1928, this represented the best of its day but fell far short of present economy and safety standards. A summary of its disadvantages is seen at left.

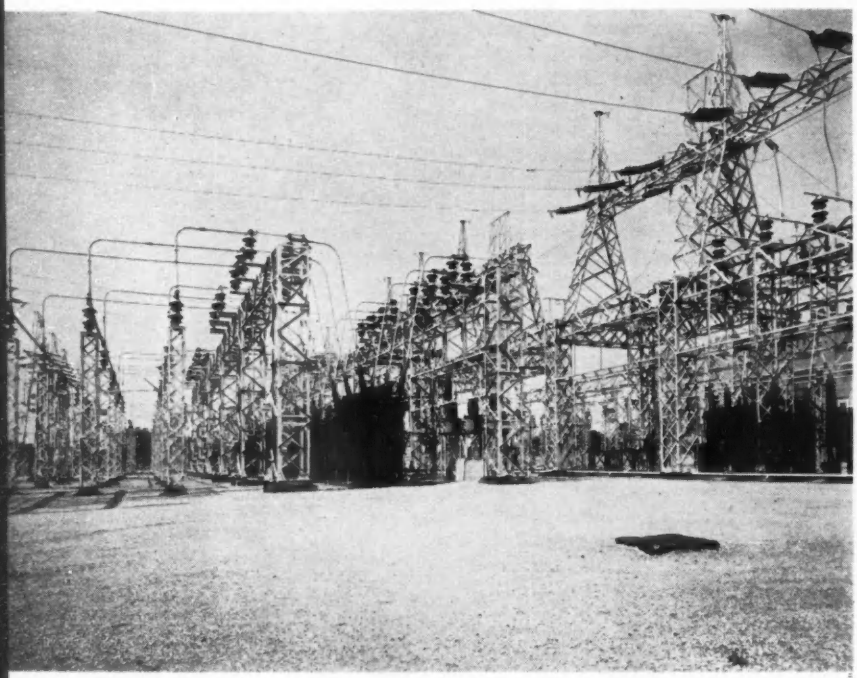


Fig 1—Double-Bus Latticed Steel Design of 1920's Has Disadvantages

1. It requires two circuit breakers for each line connected to the bus.

2. Lines and transformer taps leave substation from the center structures and are carried aerially over one of the buses, presenting the hazard of a complete bus shutdown for a broken or fallen conductor.

3. Personnel can walk on the structure from one bay to another and can accidentally contact an energized conductor in the bay adjacent to the bay which has been de-energized for work.

4. Complicated latticed steel structure requires periodic painting.

5. Bolted copper conductors require frequent inspection and maintenance.

To eliminate the cost of the second bus and to reduce the maintenance required on latticed steel structures the Philadelphia Electric Co designed a station of the type shown in Fig 2. The first installations of this design, made right after World War II, originally were equipped with bolted copper conductors. In the later modification shown here, copper was supplanted by welded aluminum conductor.

Single Bus Design

The design employs a single bus with one circuit breaker for each line, and no lines pass over any portion of the bus conductors. The installed cost of a station constructed with the same electrical design using pipes and I-beams is no greater than that of a similar station using latticed box beam members. Advantages gained by this method are shown in the box at right.

Five years ago an investigation was made of means of reducing the maintenance cost of steel structures to zero, if possible. Various materials were investigated and, because it would not require painting, structural aluminum showed a promise of reducing maintenance costs without materially increasing capital

All-Aluminum Substation

investment in the substation.

Designs for an all-welded aluminum structure were developed by Philadelphia Electric's engineering department with the assistance of the Aluminum Co of America, using a high-strength structural aluminum alloy Type 6061-T6 and retaining the features of the steel pipe and I-beam design of Fig 2. To date twelve substations operating at voltages from 220 kv to 33 kv are in service using the all-aluminum design as shown in Fig 3. Advantages gained by the change to aluminum construction are shown in the box on page 54.

The cost of the aluminum structure fabricated and delivered to the job is slightly more (about 10%) than its steel counterpart, but because of ease of construction, lack of initial painting, and grounding features, erection labor cost is about 75% that of steel. This tips the scale in favor of aluminum for total installed cost. The lack of periodic maintenance expense also favors aluminum.

Extruded Columns Used

Vertical members which replace the round steel pipe are extruded "H" column aluminum alloy welded to the supporting cross members of aluminum I-beams. The cross members in turn support the insulators and disconnecting switches. Structural aluminum has about the same tensile strength as conventional structural steel and, where rigidity is not a prime consideration, member sizes have not been increased over those formerly used for steel construction. Where rigidity is important, the low modulus of elasticity of aluminum requires that the members be larger than the steel equivalent.

When disconnecting switches, potential transformers, or lightning arresters were mounted on steel structures, it was necessary to connect the grounded parts of these devices to the station ground network by heavy copper conductors to assure a low impedance ground connection. When these devices are mounted on welded aluminum structures, no supplemental grounding path is needed because the structure itself presents a low impedance, non-magnetic ground path. All structure bases are welded to the buried copper ground grid, and the aluminum channel bases of disconnecting switches are welded to the vertical structures.

When insulators are mounted on a steel structure, it must be assumed that the steel is a rigid support and insulators may not be stressed to the full published average value of

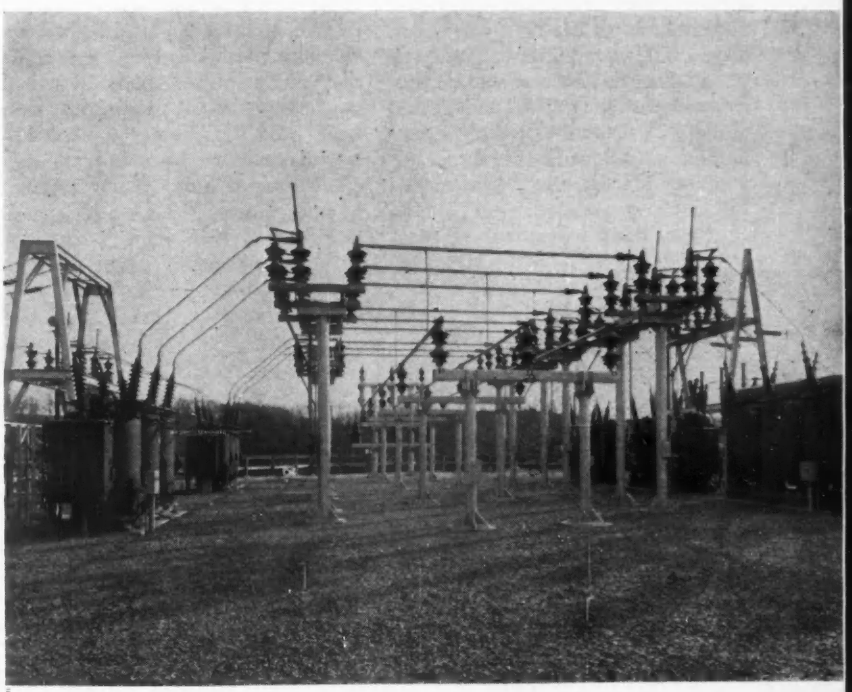


Fig 2—Improved Steel Postwar Design Incorporates These Advantages

1. Each structure is independent, so a man cannot walk on the structure to another bay.
2. Single bus design requires only one circuit breaker for each line.
3. No lines pass over any portion of the bus conductor.
4. Cost of periodic painting is reduced, although not eliminated.
5. Installed cost is no greater than latticed steel design.
6. Few bolted connections reduce bus maintenance problems.
7. Improved appearance promotes public acceptance.

cantilever strength. For high capacity buses, high strength insulators are required. However, when an insulator is mounted on an aluminum structure, the flexibility of the aluminum can be considered and the insulators worked to the full published average cantilever strength value. For the same duty bus, the aluminum structure allows the use of standard strength insulators.

The aluminum structure weighs about ⅓ that of its steel equivalent and, because of the light weight, no large crane is required to erect any part. Many large pieces can be preassembled on the ground and erected either with a small crane or without any crane. Because of these advantages, erection time of the aluminum structure is approximately 75% of that of its steel counterpart.

The aluminum structure requires no initial painting or galvanizing and will require no future maintenance painting. Because of these considerations the aluminum structure substation can be constructed and maintained at a cost below that of the steel design which it has replaced on the Philadelphia Electric Co system.

Bus conductors are made of tubular aluminum pipe, alloy 6063-T6, and are welded at all tapping and splicing points. The only bolted connections are at points of attachment to disconnecting switches, circuit breakers, transformers and similar apparatus. Consequently, there is no maintenance on the bus itself, and no inspection is required except at connection points, which are inspected at the time of routine maintenance on the associated apparatus.

The only structural components not made of aluminum are the foundation bolts (galvanized steel). This is primarily because steel provides a better bond to concrete than aluminum does.

These favorable aluminum economics led to its further use to replace galvanized steel in the conventional chain link fence. Although the first cost of an aluminum fence is greater than galvanized steel, elimination of periodic painting and improved appearance justify the use of aluminum for pipe, rail and fabric. All twelve all-aluminum substations are enclosed by all-aluminum chain link fences.

The substation is kept as low to the ground as safety permits, and it does not stand out above its surroundings as did the high latticed steel design. It can be attractively landscaped and fairly well concealed and has been accepted in residential neighborhoods.

In the original all-aluminum design vertical supports were made of ⅜-in. plate bent and welded to form a square hollow member. At that time no suitable extruded shape was available. The later design uses the "H" column described, which simplifies both the base and top connections.

Also, first design failed to recognize the flexibility of aluminum as it affected insulator application. After the original installation this was recognized and incorporated in later stations. The recent designs are less rigid than earlier ones, because a new all-welded aluminum flexible connector for tubular bus has been developed, which allows more longitudinal bus motion and permits a lighter structure.

In designing all-aluminum substations it should be remembered that a different metal is being used, and the designer should not try to convert a steel design to aluminum by merely "beefing up" members. He should pay particular attention to places where the flexibility of aluminum can be used to advantage, and he should be careful to make an economical choice of shape where rigidity is important.

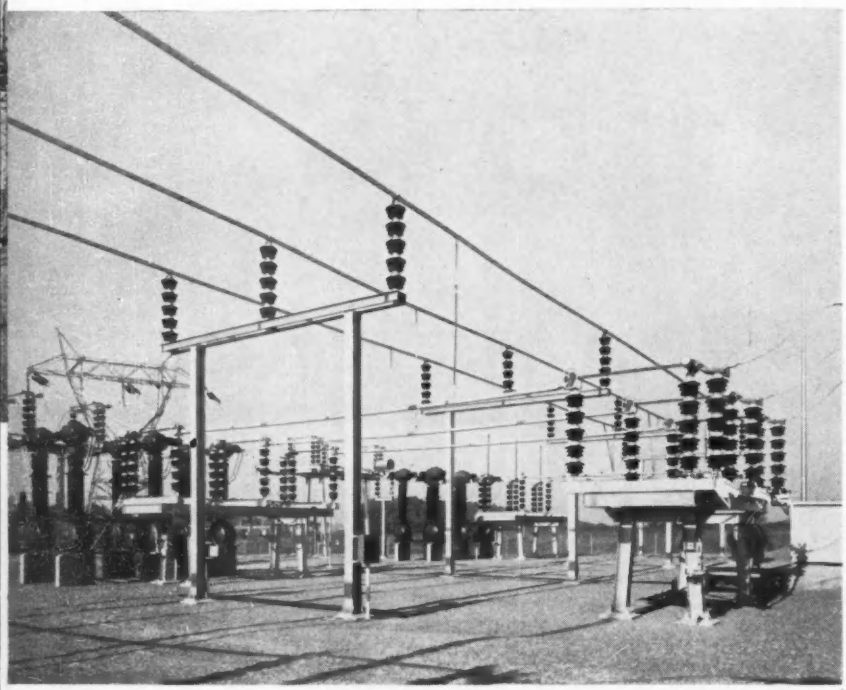


Fig 3—Today's All-Aluminum Cuts Costs, Retains Advantages of the Stand Type Design in Steel

1. Light weight speeds construction.
2. Structure requires no painting or galvanizing, either initially or in the future.
3. Maintenance costs are lower than steel designs.
4. Grounding is simplified and made more economical.

Tells NELPA Be Chary on 'Buys'

Portland speaker cites depressed market worries; meeting also hears of extended automation, supervisory control

The quality of equipment purchased in the present depressed market worries utility men, M. S. Miksch, Pacific Power & Light Co, told the Northwest Electric Light & Power Assn recently at Portland, Ore.

His own company, he said, has not bought much ahead, because some "buys" do not pan out. When it has bought ahead, the company has specified delivery dates.

Automation and supervisory control of hydroelectric systems, regardless of size, is practical, economic, and helpful in improving service and personnel relations, said H. Randle, Calgary Power Ltd.

Some 320 Mw of his company's installed 495-Mw capacity, he said, is automated and controlled remotely. These hydro units, he added, were started and stopped about 7,500 times per year, an average of 345 times per unit, each unit varying from five to 600 times. These operations, he said, amount to 98 plant years of experience and nearly 50,000 stops since 1947.

Operations Automatic

The same company's T. E. Cardell noted that within the remotely controlled plants, all operations are automatic. The complete generator starting sequence, he said, is initiated by closing a single set of contacts, either from the plant switchboard or through the supervisory equipment. Automation of all plant functions has minimized supervision by control center operators and has enabled one operator to control ten plants.

Automatic switching controls give little trouble, said Cardell, noting that most faults are the result of poor factory workmanship, and the equipment, once corrected, causes no further trouble. Items involved in trouble, he said, include auxiliary relay coils, individual contact fingers on auxiliary relays, contacts on cam-operated switches, and air-intake louvers.

M. W. Clarke, also of Calgary Power, reported a 1960 average of 18 troubles with supervisory control equipment per station. Nine, he said, were minor, not limiting the operator's control of the plant; six medium, some control features being lost but most being retained; and, three major, meaning that the control panel was lost or a major section of it failed.

Although there are more controlled generators, total generator troubles decrease each year, said Clarke, and routine maintenance at a remotely controlled plant takes only one day every two months. Troubles, occurring about once every three weeks, are generally corrected in a few minutes. For supervisory control, Calgary Power uses direct-wire, multi-conductor cables, power-line carrier, and leased telephone lines.

The average excess cost of direct-buried underground residential distribution, compared with overhead, has been about $146 per lot, said A. T. Johnson, Portland General Electric Co. PGE uses a single-phase primary loop operated open at a central point and feeding pad-mounted transformers along the loop, each containing a built-in 200-amp load-break sectionalizing switch.

For primaries, 15-kv, shielded, No. 2 copper cable with polyethylene insulation, polyethylene sheath, and concentrically-wound, bare copper, outer neutral is used. This is considered the minimum size for service to a single-family residence. Unit demand of 12 kw and a diversified demand in groups of six to 12 units of 10 kw per unit are anticipated during a design period of 30 years. The company tries to run each service to the transformer, and holds runs of secondary bus to a minimum, he said.

The best protection for primary cable is depth of burial, a minimum of 52 in. being specified which usually becomes 60 in. The primary cable is laid in the center of an 8-in. layer of sand. After some backfill, the secondary is laid in the same trench on its own sand cushion at least 30 in. below ground level.

The pad-mounted transformers are on precast pads set on a gravel backfill. This pad accommodates transformers in sizes 25 through 167 kva, single-phase, without modifications.

No protective devices for automatic fault clearing are included in either the primary cable loop or secondary. A primary cable fault results in a blown fuse at the terminal pole. The utility relies on the secondary faults to burn clear. Transformers have highside fuses to clear internal faults from the primary loop. These are sized so as not to blow for the average secondary fault current, said Johnson.

A trench position, 4 ft off the lot line in a 5-ft easement, works well for several reasons, said Don Selden, also of PGE. It leaves the cable less exposed to hole digging and brings cables up in a proper position at transformer pads with minimum extra digging. Cables are terminated at the pole with compound-filled potheads and at the transformers with taped terminations or stress cones. It has been found quite advantageous to take the cable from the reel and lay it directly in the trench, the truck continuing along the line, said Selden.

Restoration Easier

Distribution feeder service restoration after prolonged outage has not been as much of a problem in the Pacific Northwest as in other parts of the country, said Noel Hosea, Washington Water Power Co. This is probably because of the greater proportion of resistance load in space heating, water heating, and electric cooking, he explained.

The resistive portion of the "undiversified on-the-line load" for a typical WWP urban feeder upon restoration after a prolonged outage at peak load is about 75 to 80%. Higher distribution voltages, larger conductor sizes, and shorter feeder runs associated with the average 8,000-to-10,000-kwhr annual residential consumption, tend to reduce cold-load pickup problems, said Hosea.

The load factor method of esti-

(*Continued on page* 96)

7.62-Kv to Utilization Transformer

Surface unit near service entrance gives simple, flexible, and permanent Iowa P&L new-development installation

H. G. HALLY, Engineer in Charge, Transmission & Distribution, Iowa Power & Light Co, Des Moines, Iowa

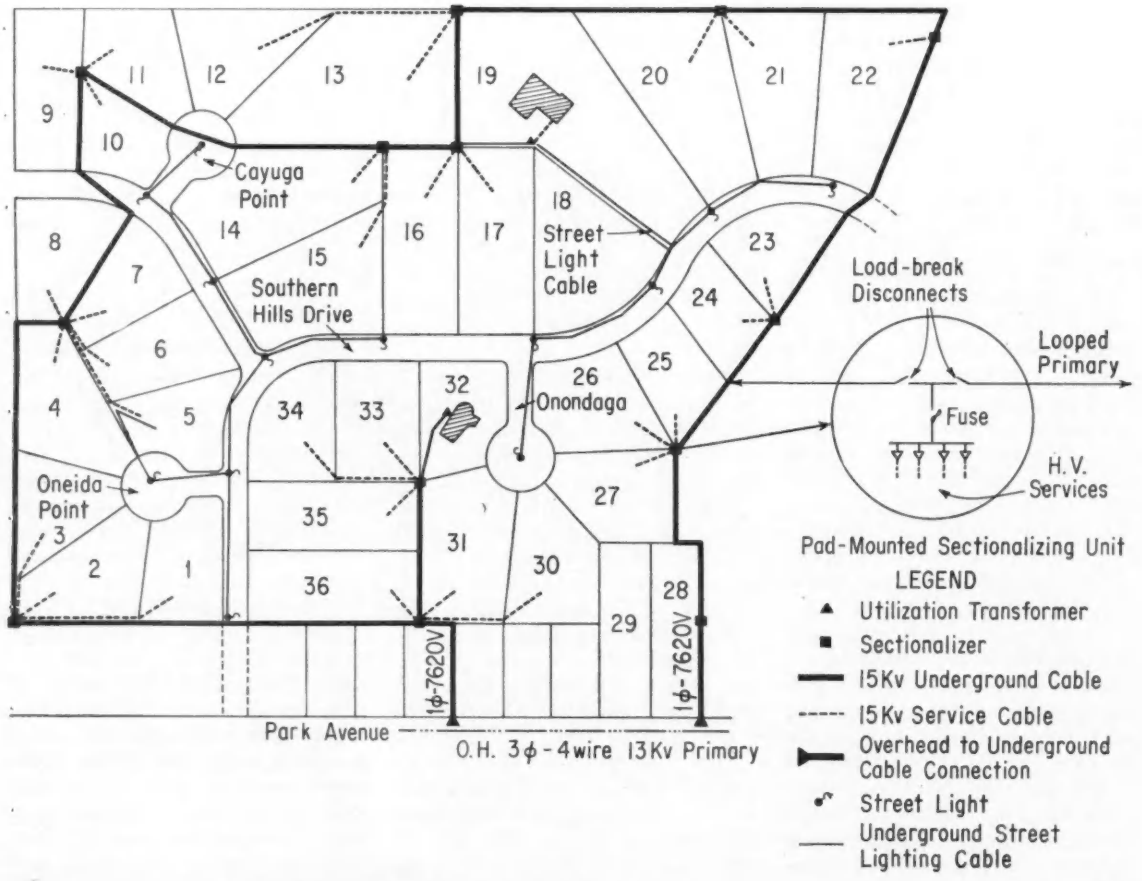
An underground distribution system, based upon 7.62-kv services and a 7,620-120/240-v "utilization" transformer near the customer's service entrance, is a step forward in systems for large, high-use residential developments.

Simplicity, flexibility, and permanence are the hallmarks of this system for the Southern Hills development of over 100 homes in Des Moines, Iowa. Cost is competitive with that of conventional underground for serving large homes when "total" cost to the user is considered.

This scheme with a utilization transformer approaches the ultimate in flexibility. Applicable to either underground or overhead, in new or established areas, and for either single or group installations, it presents a supply of practically unlimited capacity, as viewed from the transformer. The latter can be of a size to suit the customer's initial needs and can be changed easily to carry his increased demand.

This new concept reflects Iowa Power & Light Co's philosophy that the consumer ultimately bears the additional cost of underground facilities. In developing alternate schemes for residential service, the utility should compare total ultimate cost to the consumer, regardless of how the initial construction cost of the facilities may be shared. The underground cost estimates should include all facilities from the primary cable riser to a point of delivery at the residence comparable to those of a conventional overhead system. Thus the installed cost of all primaries, transformers, secondaries, street lighting, and services are in the comparisions.

This philosophy recognizes that the point of delivery should be in an "equivalent overhead position" in order to provide the home owner with the same service responsibility



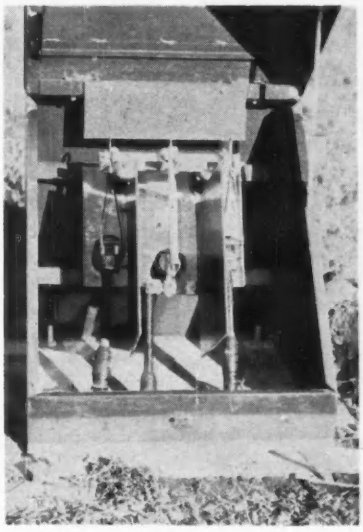
SOUTHERN HILLS near Des Moines has 7,620-v loop system supplying 7,620-v services and utilization transformers which are installed as lots and homes in the $100,000 price range are individually sold and constructed

Cuts Residential Underground Cost

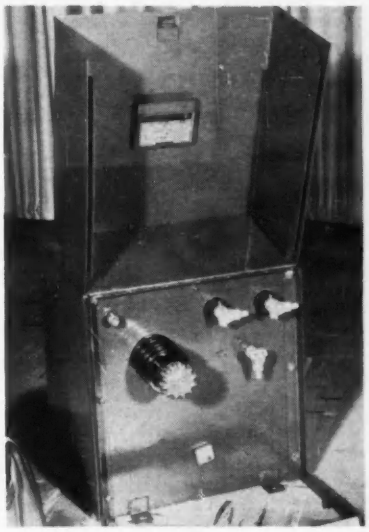
from the utility. The home owner remains the utility's customer long after the original installation and the contract with the builder have been forgotten. He looks to the utility for maintenance. It is therefore best for the utility to install, own, and maintain the entire underground system, thus avoiding future customer-relations problems occasioned by some previous "special arrangement".

Iowa P&L believes that this philosophy of underground service, plus further development of lower-cost utilization transformers, sectionalizing equipment, and cable terminations, will bring application of the system to all kinds of residential developments requiring underground service.

Iowa P&L entered negotiations three years ago to provide an underground distribution system in the Southern Hills development, which was planned in two parts. The first was plotted in two and three-acre lots to be sold piecemeal for custom-built homes in the $100,000 price range. The second, to be developed later, will offer smaller lots.



LOOP SWITCHING of primary system goes through sectionalizing units housing two disconnects and service fuse



PRODUCTION MODEL of utilization transformer holds 5, 10, or 15-kva core and coil in an oil-filled housing

Pad Mounts Ruled Out

Initial negotiations pointed to the use of pad-mounted transformers and 120/240-v secondaries at the rear lot line, and a 200-amp service entrance of about 150 ft of 3/0 600-v cable installed piecemeal for each customer. The difference between equivalent overhead and underground service was $430 per lot plus $600 for each service run, coming to a total of $1,030 per customer. In addition, each home owner would be responsible for the maintenance of his service cable.

In line with the company's philosophy of underground service, the Southern Hills layout was re-studied and 7,620-v services and utilization transformers were incorporated as part of the utility's installation. The increase in the utility's cost came to $294 per lot. Thus the home owner's total cost would be $430 plus $294, or $274. With an apparent savings of more than $300 per home owner, the Southern Hills contract was re-negotiated. Furthermore, a study of total system losses, including transformers, showed a 5.1% saving in losses favoring the transformer scheme over conventional underground.

Installation proceeded in 1960. In effect, this system has a 7,620-v, single-phase secondary loop about 7,000 ft long at the rear lot lines and switched at various lot line corners around the loop. The 7,620-v services are tapped from a fused bus at each switching point.

7.62-Kv Loop Built First

The loop system and switching points were installed first. As each home is built, a 7,620-v service is tapped from the nearest switching point and extended to the utilization transformer close to the residence. Thus transformer capacity is installed only as required by actual load.

The loop cable is direct-burial 15-kv concentric grounded-wye No. 4, single-conductor, 19-strand copper with 19/64-in. butyl rubber insulation, semi-con tape and 12 No. 14 solid tinned copper conductors for an outer wrap and neutral. Cable for the 7,620-v services is the same as the loop cable except that the conductor is No. 6 or 8. Both sizes are being installed. Service cables are in 2-in. duct on a somewhat direct line across the yard, between the nearest switching point and utilization transformer. Services in duct provide mechanical protection for the cable and ease replacement of damaged cable.

Both the loop and the service cable are buried at a 42-in. depth. The loop cable occupies half of a 10-ft easement strip. The other half is occupied by the telephone system in a separate trench at a 24 in. depth. Joint administrative and construction problems were non-existent.

The buried loop system is switched through a pad-mounted sectionalizing unit. This unit, measuring 29x29½x31½ in., provides for sectionalizing the high-voltage supply circuit and contains a fuse for six high-voltage services. It has two 100-amp switches with load break attachments and a boric acid type fused disconnect for protecting six 7,620-v services. The fuse, rated 25 E amp, has an interrupting capacity of 5,000 amp. This fuse rating protects the No. 6 or 8 service cable as well as the utilization transformer against both primary and secondary faults.

To attack the high initial cost to the customer resulting from use of a conventional transformer and

vault, work was done by Iowa P&L on its own and in cooperation with Westinghouse Electric Corp toward development of a surface-mounted transformer. This work aimed at a "package" designed simply as the connecting link between a high-voltage radial service and the desired utilization voltage. Following design and in-service experimentation with two prototype models, the present production model was built.

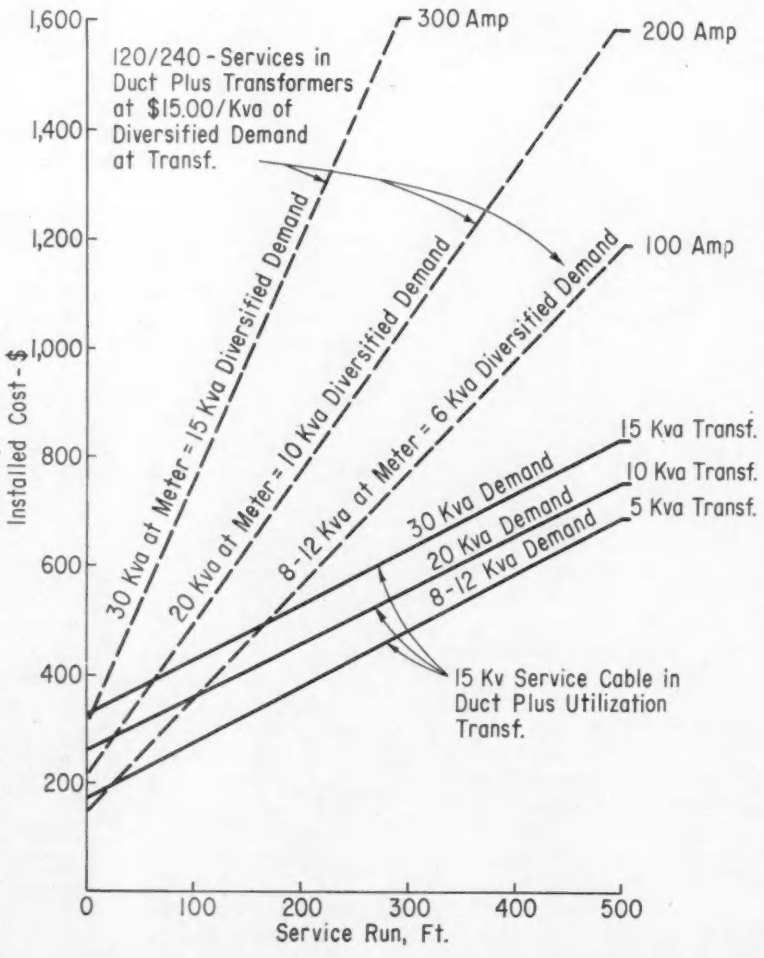
The unit consists of a conventional core-and-coil assembly in an oil-filled rectangular housing 19x 18½x18-in. With the cover in place over the bushing, the complete unit is 26 in. long. This relatively small length allows use of the transformer close to a residence and facilitates concealment by shrubbery.

The transformer is available in the same housing for ratings of 5, 10 or 15 kva. The thermal capability allows loading to 200% of nameplate rating. A single size precast concrete slab about 2x3 ft accommodates the unit. Two bolts hold the unit to the pad.

A primary voltage of either 7,620 v or 2,400 v is available, with a secondary voltage of 120/240 v. Access to the high and low-side connections is through a locked, hinged cover. Primary protection and disconnecting means is a fuse where the high voltage service cable is connected to either an overhead or underground primary circuit at the lot line. Because the unit can close to the customer's service entrance fuse or breaker, no secondary protection is necessary.

This production unit is forest green in color, but can be repainted in the field to suit the customer's color scheme. The price is close to the present price of pole-mounted transformers of the same kva rating.

Utilization transformers were applied in the Southern Hills development on the basis of experience with high-use residential demands for service entrance requirements of 100, 200 and 300 amp. In general, the 5, 10 and 15 kva ratings are applied, respectively. This application anticipates a 30-min peak demand at the meter equal to about 50% of the rating of the service entrance switch, and loading the utilization transformer to about 200% of nameplate during the peak.



COST COMPARISON shows advantage for scheme over conventional underground. Scheme uses inherent overload capability, range of transformer sizes

Good Regulation Aids Loading

This loading practice takes advantage of the inherent overload capability and low impedance of the utilization transformer. Because the voltage drop in the 7,620-v secondary system and services is nearly negligible, all of the allowable voltage drop can be taken through the transformer. Thus the Southern Hills installation presents a permanent high-capacity system capable of absorbing any foreseeable residential load, subject only to the limits of loading and voltage drop in the utilization transformer. The transformer can be easily changed to cater to the requirements of individual consumers without disturbing or changing other components. This advantage is of great importance, when weighed against the prospect of changes in a conventional 120/240-v secondary underground system with large pad-mounted transformers at the rear lot lines.

Developments now under way include a dry-type utilization transformer for mounting inside the residence, and a molded case sectionalizing unit for loop switching. Metering may be included on the dry-type unit. Ultimately, however, a completely buried sectionalizing unit and utilization transformer should be available.

The customer's service entrance requirements and the length of the service run determine the economics of the scheme. This is evident from a comparison of the installed cost of scheme with the installed cost of various lengths and capacities of

(*Continued on page 94*)

UTILITY EXECUTIVES who were speakers at the Pacific Coast Electrical Association's convention at San Francisco are identified by namecards. Their company affiliations are given in the text, with their views on the industry

PCEA to AEC Offer: 'No Thanks!'

Utility men at San Francisco veto US aid in A-plant construction; last PG&E conventional unit seen in late 60's

A proposal that the federal government build large nuclear power plants for ultimate purchase by investor-owned utilities was greeted coolly by utility executives attending the annual convention of the Pacific Coast Electrical Assn at San Francisco, Cal.

"We've gone so far in this field that we prefer to go it alone," said N. R. Sutherland, Pacific Gas & Electric Co.

"Time-honored business practices may be slower but make for a definitely healthier situation in the long run," declared Harold Quinton, Southern California Edison Co.

The proposal, voiced by A. J. Vander Weyden, Atomic Energy Commission, was intended as a spur to the building of commercial prototypes to demonstrate, by 1968, that large nuclear plants can be competitive in high-fuel-cost areas. It contained these steps:

1. That the government build the plants in investor-owned utility grids.

2. That the utilities purchase the plants' power during government ownership.

3. That the utilities purchase such plants once their reliability and economics had been demonstrated.

Neither Sutherland nor Quinton found any attraction in the idea.

"We have been operating on the principle that we could not take any direct subsidy from the government, and PG&E has not even included waiver of fuel use charges by the AEC in figuring costs," said the former.

"I have a feeling," said Quinton, "that incentives from the government, while they may aid in developing the art, will not develop the best economics."

AEC officials are concerned over the decline of utility enthusiasm, said Vander Weyden, noting that the response of investor-owned utilities to recent third-round invitations has been discouraging.

"In my opinion, at least two reactor systems have been carried through the experimental and prototype stages to the point where only actual construction and operation of commercial-scale units are needed to demonstrate that they are economic," he said. "Why aren't utility companies building the plants?"

Reviewing the California fuel situation, W. K. Davis, Bechtel Corp, noted that fuel imports, primarily gas, would rise from 36.8% in 1960 to 62.2% by 1975, if nuclear fuel is not used. This increase, he said, would be needed to meet a rise in demand from 1,425 trillion to 4,650 trillion Btu.

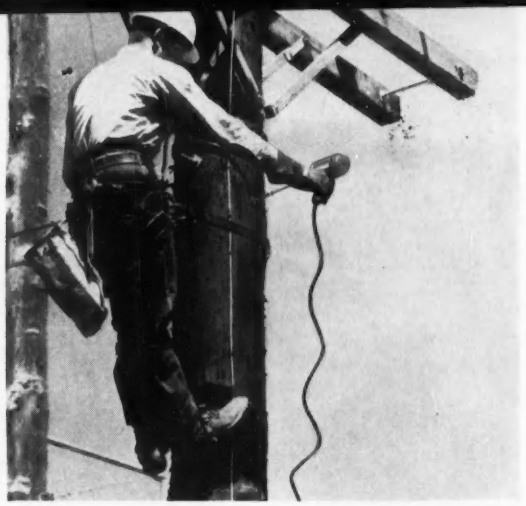
"Unfortunately for nuclear plants, it is necessary to buy from one to three years' fuel inventory before commencing operation, a situation which does not obtain in any conventional plant," said Quinton.

He noted that conventional plant costs continue to range from $80 to more than $200 per kw, with $150 per kw the mean. A nuclear plant, competitive at $150, may not be so at $120 per kw, the current figure for southern California, he said.

Furthermore, what assurance has a utility, in proceeding with the design of a nuclear plant, that it will

(*Continued on page* 96)

'Impact-Bit' Development Simplifies Pole Drilling



LEFT HAND DRILLING is easy, even at right angles to the lineman's position, using an electrical impact wrench

C. CLYDE CROCKETT, Transportation Superintendent, Louisiana Power & Light Co, New Orleans, La.

A modified ship-auger wood bit, driven with an ordinary ½-in. impact wrench, either electric or pneumatic, is now being used by Louisiana Power & Light Co to make drilling wood poles, timbers, and crossarms simple, easy and safe.

"Impact" drilling provides a number of advantages over the conventional continuous-power drilling technique:

- No appreciable torque must be overcome—lineman may drill a hole in a pole from a position other than directly behind the drill; also, there is no possibility of the drill being torn from the operator's hands if sudden hard drilling is encountered.
- No clogging of the bit because the impact action breaks up the wood shavings which then feed out of the hole continuously, even on newly creosoted poles. No longer is it necessary to withdraw the bit at intervals to remove the clogged wood—the pole may be drilled through without stopping.
- Only one power tool is required to do both drilling and bolt work.
- The electric-driven "impact" wrench is much lighter than a conventional continuous-power electric drill (7¾ vs 12 lb), and much better balanced for ease of handling. Although the air-driven impact wrench is heavier than the conventional continuous-power air drill (6 vs 3¾ lb), the latter lacks the other advantages of impact drilling noted here.

The total effect of all these advantages is a safer, quicker, less fatiguing means of drilling holes in wood poles, timber and crossarms.

The especially developed drill bit-impact wrench assembly referred to here is the result of an overall program aimed at providing powered hand tools for all Louisiana P&L line construction, basket and substation trucks.

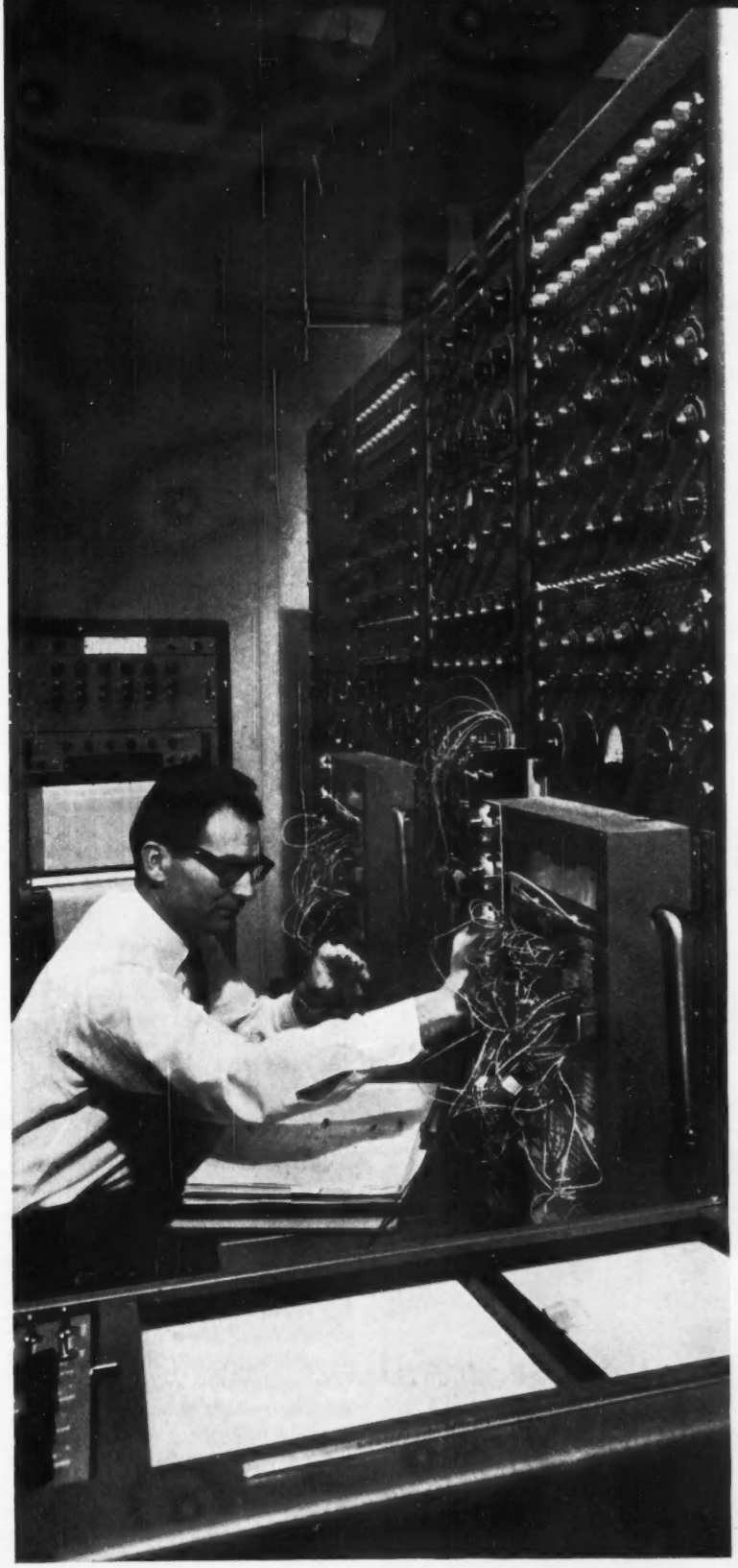
In 1958 Louisiana P&L, in an effort to improve pole-drilling operations, removed the tapered shank from an $\frac{11}{16}$-in. ship auger bit. This modified bit was then gripped in the jaws of a Jacobs chuck which had previously been modified to fit onto the ½-in. square-drive head of a standard impact wrench. "Impact" pole drilling results with this tool assembly were excellent but the assembly still had many bugs. For instance, after a minimum of drilling, the fit of the impact wrench's square-drive head into the square socket of the drill became sloppy; also, the surface of both the bit's shank and the chuck's teeth became burred and damaged. Furthermore, it was soon realized that the added weight of the heavy-duty Jacobs chuck, mounted on the end of the impact wrench, made for a badly balanced tool. Excessive operator fatigue, and numerous snapped-off drills, indicated that further development work was required to achieve the established advantages of "impact-drilling."

Louisiana P&LCo coordinated their initial work with a manufacturer of quality specialized tools, the Snap-On Tools Corp, Kenosha, Wis. After extensive development and field-testing work, Snap-On came up with a greatly improved tool which is now being used to excellent advantage at Louisiana P&L. The new tool assembly is comprised of a set of special ship auger-type bits.

Each bit incorporates an over-size shank, the end of which is formed into a precisely-trued ½-in. square-driven socket head. The perfectly aligned socket head achieves a snug fit with the impact wrench's drive-head. All the inherent advantages of "impact drilling" have been achieved with the developed lightweight, well-balanced tool assembly.

EQUIPMENT furnished linemen at Louisiana Power & Light Co permits both impact drilling and bolt work

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



COMPUTER STUDIES BY GENERAL ELECTRIC PROVE . . .

Reduced Regulator Bandwidths Increase System Earnings

General Electric voltage regulators provide three added benefits to distribution systems through bandwidth reduction . . . extra feeder length, capacity, and revenue! New G-E computer studies now prove that *reduced regulator bandwidths are practical* and that they result in increased distribution system performance with *no sacrifice of regulator life.*

Electric utilities have long recognized the desirability of bandwidths as low as $\pm 3/4$ volts. The assumed stumbling block was the number of regulator operations. Through analysis of actual (as opposed to theoretical) data, these studies indicate that bandwidths of $\pm 3/4$ volts are feasible from any standpoint, including that of equipment life.

Your General Electric regulator representative can show you the specific effects of reduced bandwidths on regulator operation. He will show you how to determine if operations must be controlled . . . and if so, how to control them.

And he will illustrate how these reduced bandwidths can now be easily set with G.E.'s exclusive new Micro-Band* voltage regulating relay —the first to offer you *calibrated adjustment* of both voltage level *and* bandwidth.

Micro-Band relays make possible more *usable* kva on the line. This easily attainable "power adder" can mean increased line length and capacity—important tools to increase feeder revenue.

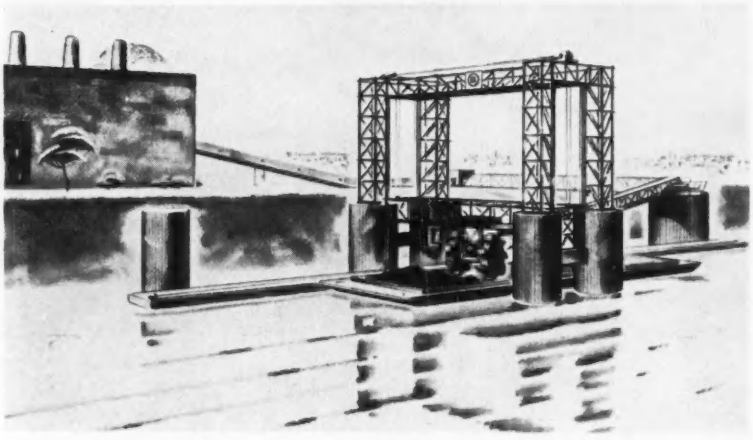
To increase the return on your regulator investment—possibly with your existing equipment—get the full story on Micro-Band calibrated relays and reduced bandwidths from your G-E Sales Engineer. General Electric Co., Schenectady 5, N. Y. 456-02A

* Trade-mark of the General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Coal Barge to Be Unloaded At 3¢ Per Ton



Designs for a new coal barge unloading system have been announced by McDowell-Wellman Cos, Cleveland. In the foreseeable future, their system could involve at least 60 million tons of coal a year, a big percentage of the amount carried by barge through America's inland waterways.

The system is reported to be a low-cost, high-capacity, automated barge unloading terminal. Basic component is the rotary bucket wheel, used successfully in European coal handling for about 30 years.

The typical M-W plant, rated at 3,000 tons per hr, could handle 10,800,000 tons a year at 3¢ a ton.

The unloading apparatus is supported by four structural steel towers, mounted atop steel-sheeted pilings. These cross-connected towers support an elevating bridge which spans the barge berth. A trolley within this bridge carries the bucket-wheel unit and the lower end of the collecting conveyor; the upper end is mounted on a traveling pivot and connects with a conveyor system.

Because of the system's automated features, unloading is essentially a one-man job. The operator positions the wheel initially and guides it through one cycle with the first barge in the terminal. The travel limits established in this first cycle are registered on a "memory tape" which can be filed and fed to the controller whenever similar barges enter the terminal.

'Home' Encapsulated Transformer Is Exhibited

Installation of General Electric Co's new 25-kva encapsulated transformer on the side of a mock-up individual home was exhibited to members of the Western Underground Committee in Modesto, Calif., at the May meeting. The Western Underground Committee is composed of representatives of investor-owned utilities and municipalities in California, Nevada, Arizona, and Hawaii. It meets four times a year to discuss developments in the field of underground transmission and distribution.

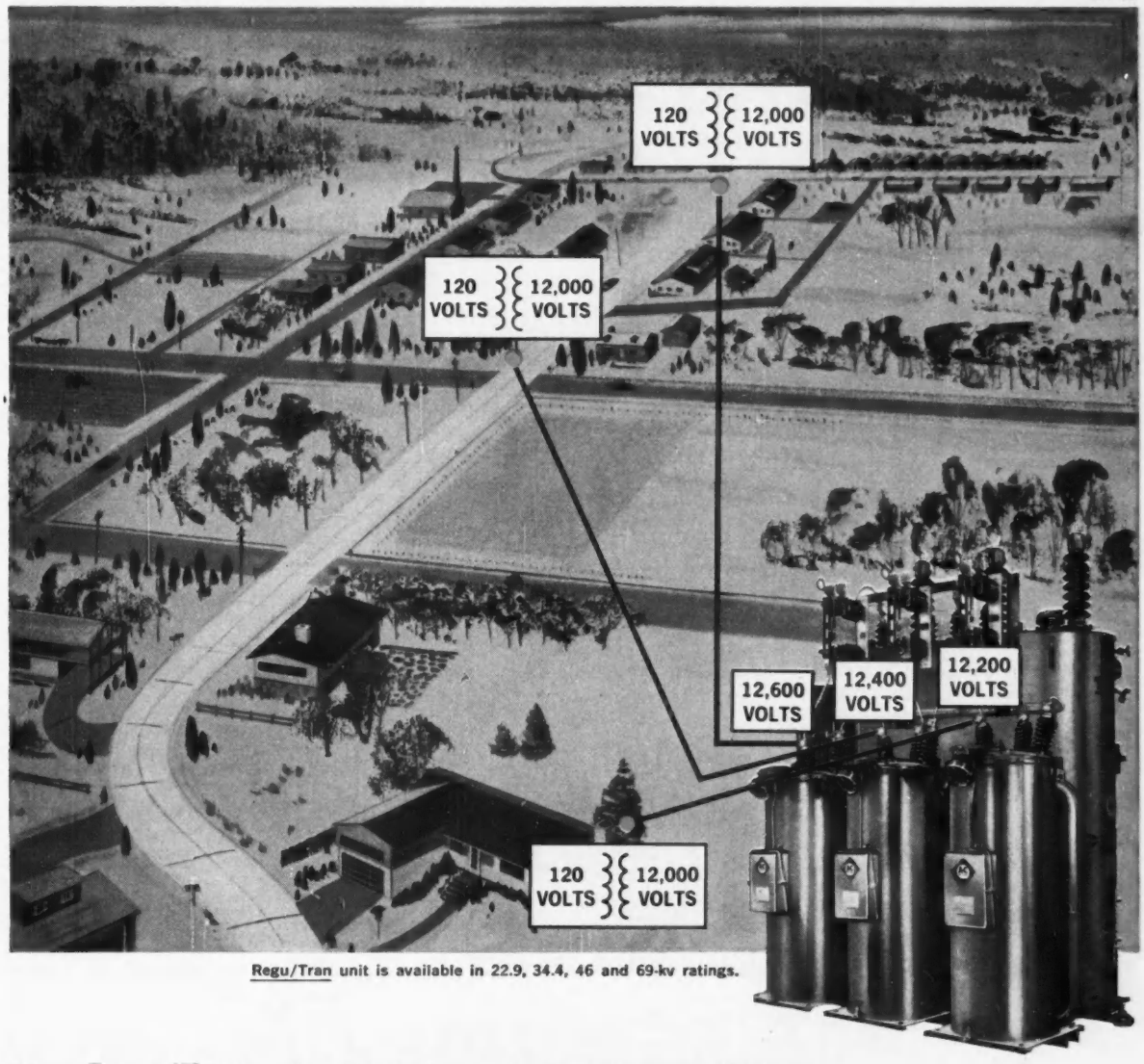
The pull-box, mounted on the house's outdoor-side, encloses the transformer to which are run underground primary cables. Mounted on the inner wall is a standard circuit breaker panel. This particular installation shows two meters, one for measuring demand and the other energy consumed.

Fred Van Wormer, electric utility application engineer for GE, discussed various ways to serve a home by underground distribution and said that cost studies indicated eight homes per transformer to be the most economical, with each service going direct from each transformer. Russ Morris, GE distribution transformer product planner, stated a number of utilities will make trial installations of GE encapsulated transformers, up to 25 kva in size and in a variety of arrangements, later this year.

(*More News of Manufacturers, p* 64)

ALLIS-CHALMERS

A-1443



Regu/Tran unit is available in 22.9, 34.4, 46 and 69-kv ratings.

New Regu/Tran unit with independent phase regulation

improves voltage control, increases revenue

Regu/Tran units are the economical answer to the problem of unbalanced loads and varying lengths of single-phase feeders. Three single-phase regulators with famous *Feather-Touch* control are super-sensitive and responsive to voltage changes. You get 1% control accuracy and 20% range of regulation. Advantage: increased revenue, better customer relations through improved voltage regulation!

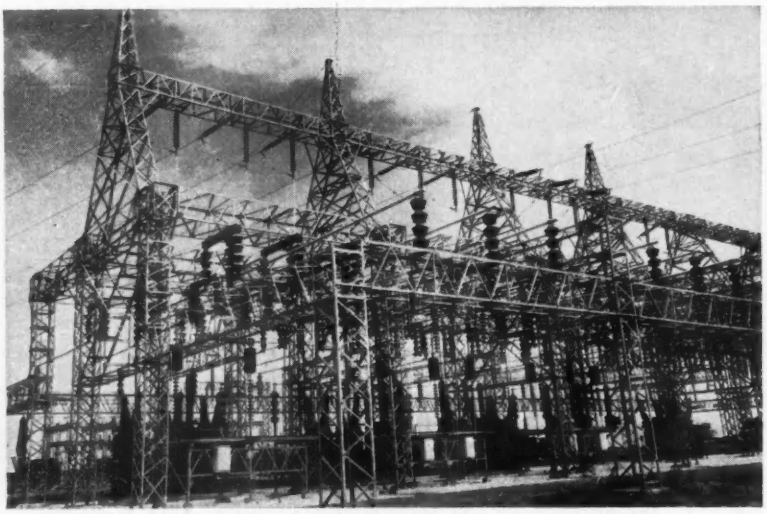
- **SAFETY** — By-pass switches when required are fully visible. Permit de-energizing regulators and control without dropping service.
- **TAILORED REGULATION** — If just ±5% regulation is needed, that's all you purchase. No need to pay for unused voltage range.
- **VERSATILITY** — Use transformer and regulators as separate units.
- **MINIMUM INVESTMENT** — Buy Regu/Tran transformer first. Add regulators, by-pass switches as you need them.

Check these additional benefits of a Regu/Tran *unit.* **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Regu/Tran and Feather-Touch are Allis-Chalmers trademarks.

FLINT

DISTRIBUTION AND SWITCHING SUBSTATIONS



Always Include:

- ATTRACTIVE PRICE
- BEST QUALITY
- LOW TRANSPORTATION COSTS
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Manufacturers' Exhibits Will Support Technical Sessions

Should a technical meeting of electrical engineers have its sessions supplemented by engineering exhibits of electrical and electronic products and services? More than 70% of the members of the American Institute of Electrical Engineers who recently were asked this question replied, "Definitely yes!"

As a result, the first industry-wide Electrical Engineering Exposition will be held in the New York Coliseum, Jan. 29—Feb. 2, 1962. The week-long event, sponsored by the American Institute of Electrical Engineers, will be held in conjunction with the technical sessions of the AIEE Winter General Meeting.

Manufacturers are currently reserving space in the exposition at the rate of one a day. Detailed information about the Electrical Engineering Exposition, floor plans of the exhibit areas in the New York Coliseum, exposition regulations and applications for space may be obtained from the Reber-Friel Co, 117 S 17th, Philadelphia 3, Pa.

Radio Ignition Noise Minimized, Range Extended

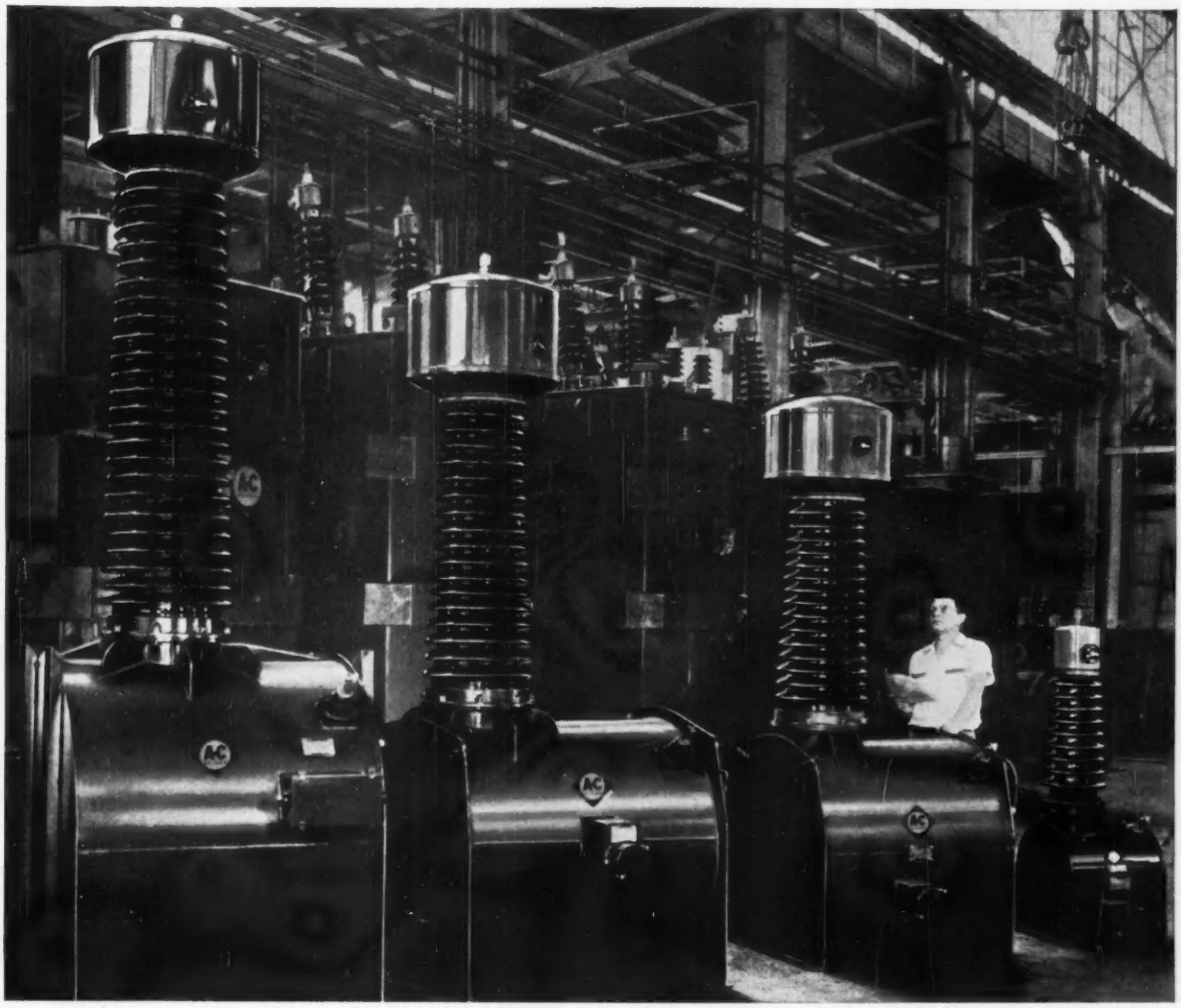
A means of suppressing radio ignition interference caused by vehicular electrical systems has been developed by the Communications Division of Motorola Inc. The development is reported to extend effectively the operating range of utility two-way radio systems, while providing more reliable reception in heavy traffic areas.

Ignition-noise problems have, in recent years, increased tremendously—due to a combination of high-compression vehicle engines—more traffic and the switch to narrow radio channels. Motorola's patented "Extender" circuitry is said to be the first effective solution to the degrading effects of ignition noise.

In the "Extender," ignition noises are automatically detected in the early stages of the radio receiver. Extender operation "turns off" the mobile receiver for the 2-3 microsec duration of each spark plug ignition impulse. Since it takes hundreds of

ALLIS-CHALMERS

A-1491



Outdoor potential transformers in 230, 161, 138, and 69-kv ratings.

A complete line

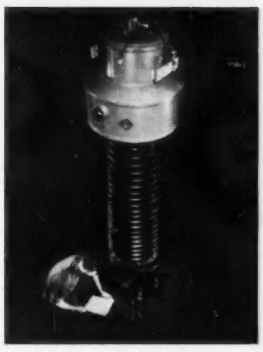
that meets your burden requirements

Allis-Chalmers is ready to serve your requirements with this complete line of corona-free oil-filled current and potential transformers from 25 through 345 kv.

In the Allis-Chalmers *corona-free* design, the insulation structure is arranged to keep electrical stresses at a minimum, thus eliminating *all* possibility of corona formation. By skillful designing of the insulation structure, ample oil passages exist which facilitate oil impregnation and assure free circulation of the oil. This open-type construction gives a decided bonus in thermal capacity.

Every unit receives the required ASA dielectric tests *plus* quality control impulse tests.

Contact your nearby Allis-Chalmers office for complete information on this line of high voltage instrument transformers, or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1 Wis.*



Outdoor current transformer, 900 kv BIL.

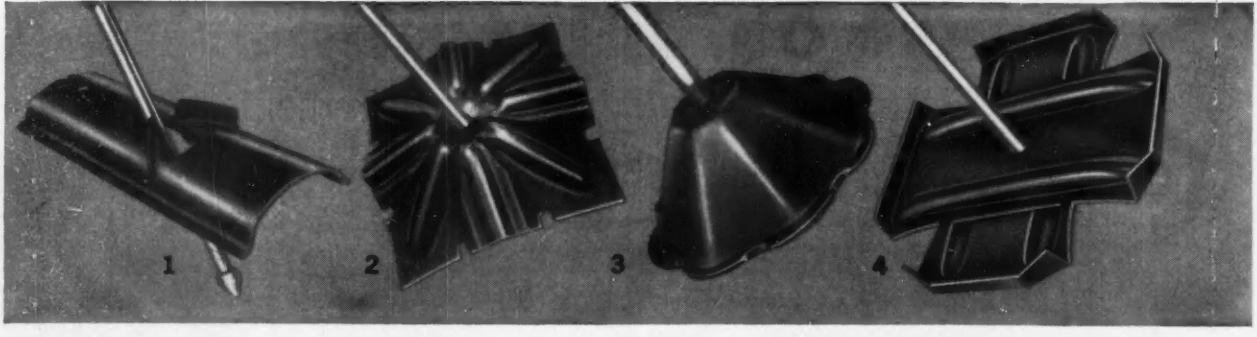
SOIL AND PULL TESTS

from coast to coast . . .

Soil probes help determine anchor size, type and depth required for every condition.

Thousands of pull tests in every soil type in the U. S. A. prove Chance anchor stability.

ABC INDUSTRIES



1. NEVER-CREEP ANCHOR Pulls entirely against solid, undisturbed earth. Holds more load than any other type of anchor.

2. 8 WAY EXPANDING ANCHOR Slips down a hole no bigger than the base plate. 8 rib reinforced blades expand into solid earth all the way around.

3. STEEL CONE ANCHOR Cuts the cost of guying in hardpan, adobe clay, or rocky soil. Gives exceptional holding strength.

4. CROSS-PLATE ANCHOR For guying "big stuff" like transmission lines. Installs in vertical machine bored holes. Costs 50% less than a log dead-man--holds more.

...part of the research behind the product you get when you buy

Chance Anchors

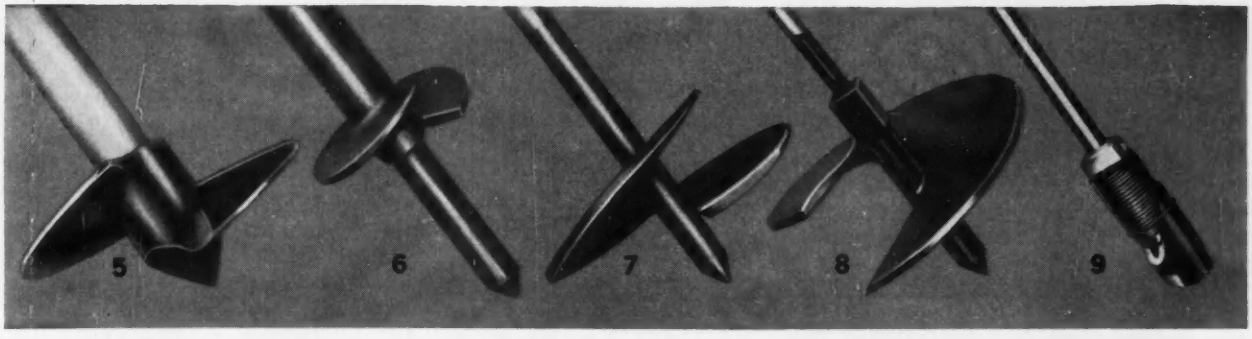
There's a great deal more than metal fabrication behind A. B. Chance Company anchor production. Soil analysis, trial installations and pull tests under *every conceivable condition* have been a part of the development of every anchor. Many power companies have cooperated in this nation-wide program to improve anchors and anchoring techniques. If you have taken part in this activity, you know something about the Chance Company's internal development work that goes far beyond field tests to give you a better product; to fit anchors to modern mechanics and to the specific soil conditions involved, and to simplify handling, stocking and identification of the product in your storage and on the job.

These are the reasons why you can have complete confidence when you buy Chance Anchors. The fact that stocks are available to you or your supplier within 48 hours (usually much less) from any one of ten Chance Servi-Centers across the nation gives you another good reason for specifying Chance.

A. B. CHANCE CO. CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CA61-11



5. SWAMP ANCHOR For difficult swamp guying. Screws down to any depth required to get sufficient holding power.

6. FOUNDATION ANCHOR New... for installing transformers without concrete pads! Provide a solid "foundation" for "pad-mounted" or power transformers.

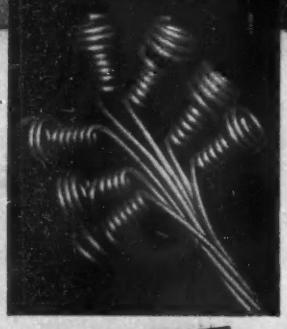
7. NO-WRENCH SCREW ANCHOR Pitch-controlled blade goes down fast, adds to holding power. Can be installed by hand.

8. POWER SCREW ANCHOR Lets you mechanize screw anchor installation with your power hole-digging equipment. Anchors install in 6 to 8 man minutes.

9. EXPANDING ROCK ANCHOR Expands and wedges against solid walls of rock. Does away with expensive lead or concrete grouting.

STEEL STRAND

Mandrel Test*



Checked and Double-Checked by Laboratory Technicians

Every coil of wire used in the manufacture of *Crapo* Galvanized Steel Strand is tested and approved by trained laboratory technicians. Samples from both ends of each individual coil are subjected to a series of prescribed tests before stranding. Then, the finished strand is re-checked to make certain that it conforms in every respect to established specifications and our own high quality standards.

Thus you know when you specify *Crapo* Galvanized Strand that every precaution has been taken to assure maximum performance in the finished product.

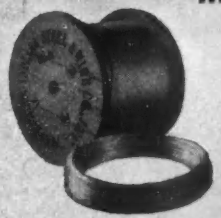
Write for Free Booklet

"The Story Behind Crapo Galvanized Wire and Strand" illustrating and describing manufacturing techniques and testing procedures. Ask for Booklet B-59!

AVAILABLE IN 3 COATING WEIGHTS

FOR GUYS, MESSENGER AND OVERHEAD-GROUND WIRE

Crapo Steel Strand is available in all standard sizes and grades and in Class A, B and C galvanized coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.



*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

microseconds to transmit a single vowel, it is said that quieting the receiver for the impulse duration does not affect the clarity of the message. Increased radio-coverage area is achieved by knocking out ignition-noise interference that ordinarily would override the message in a weak signal area.

An added feature of the new Extender model radios is the rejection of intermodulation and desensitization. A three-position switch on the radio-control head enables users to select automatic ignition-noise suppression, intermodulation rejection, or standard receiver operation.

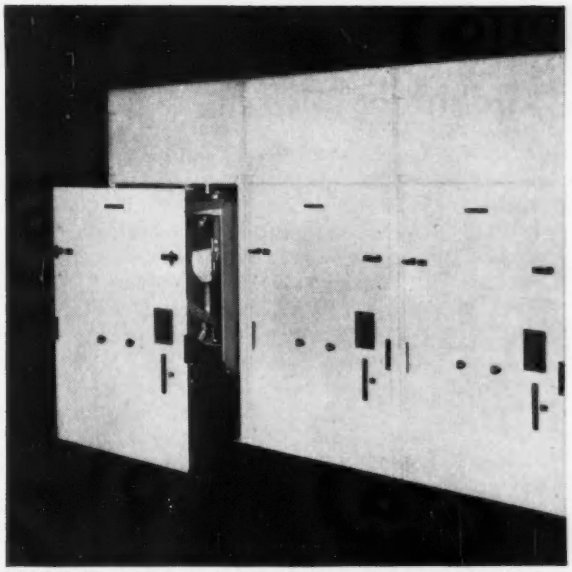
One-Million GPD Sea Water to Be Converted

Westinghouse Electric Corp has begun construction of a one-million-gpd plant which will convert sea water to fresh water at Point Loma, near San Diego, Calif. A contract for the project, which was awarded by the US Department of Interior's Office of Saline Water and which is sponsored jointly by the State of California Department of Water Resources, calls for construction to be completed during November of 1961. Westinghouse will then operate the plant for a shake-down period of 75 days, including 30 days at the full daily output of one-million gal. Once in operation, it will be the largest multi-stage flash-evaporator plant in the United States.

The flash-evaporation process used in the Point Loma plant will consist essentially of spraying heated sea water under pressure into a chamber that is at a lower pressure and temperature. A portion of the water "flashes" into vapor and then is condensed, providing water which is nearly free of impurities. The remaining salty water passes through a series of additional chambers where the flashing process is repeated. At each additional stage, the condensed, salt-free water is piped off.

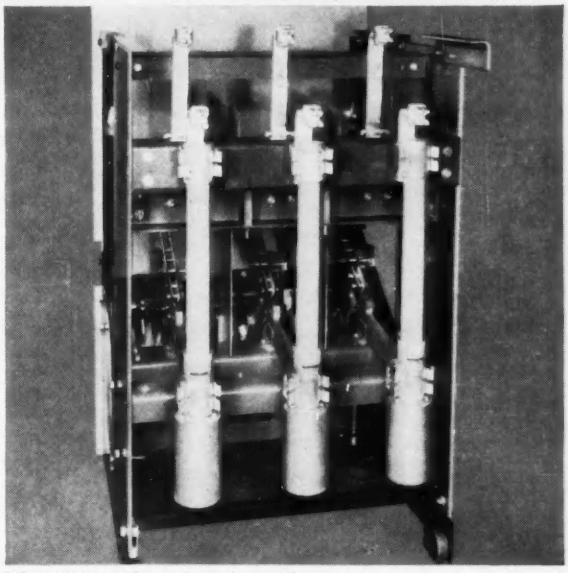
The architectural - engineering services were handled by the Fluor Corp, Ltd, of Los Angeles. The Ralph M. Parsons Co, of Los Angeles, is participating in the engineering and construction of the plant.

New...Low-Cost, Drawout DFS Metal-Enclosed Load-Interrupter Switchgear



DFS Switchgear comes in single units or switching centers, as shown, for service entrances, transformer primary or feeder switching.

DFS drawout switch and fuse element is easily levered into cell.



DFS switch and fuse element, rear view.

Type DFS Metal-Enclosed Switchgear—*drawout fused switch*—provides compact, low-cost power switching for high voltage circuits in commercial buildings, institutions, and small industrial plants. DFS Switchgear meets a wide range of applications—with fault interrupting ability up to 250 mva at 4160 volts and 500 mva at 13,800 volts . . . load break rating 600 or 1200 amperes . . . full fault closing ability of 60,000 amperes for 5 kv and 40,000 amperes for 15 kv.

DFS Switchgear provides these major advantages:

Drawout design assures completely safe switch inspection and fuse replacement.

Component design versatility meets a broad range of applications, including automatic transfer and remote control.

Simplified metal-enclosed construction presents compact, modern appearance.

Maximum service reliability assured by extensive High Power Laboratory design-proving tests.

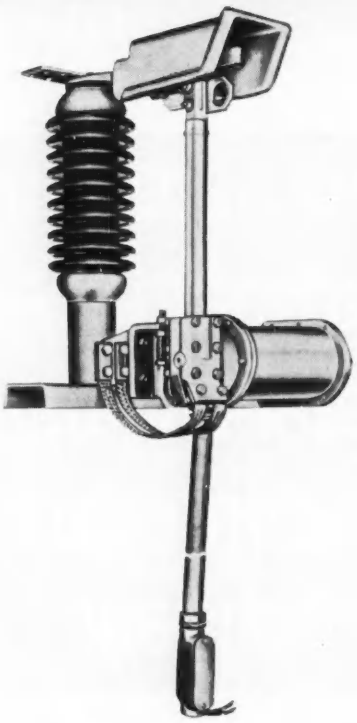
For full information call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa., for Descriptive Bulletin 32-750. *You can be sure . . . if it's Westinghouse.*

J-61011-R1

Westinghouse

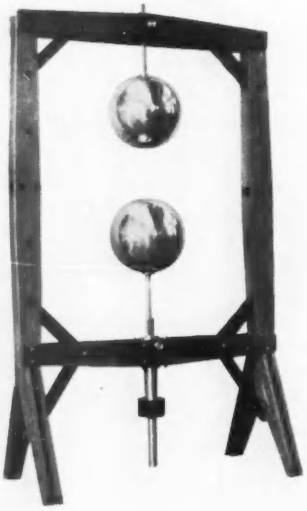
New Equipment

Grounding Switch . . .



. . . 34.5 kv, features 4-cycle closing time. Application of Type HSG to trip remote breakers for high-speed transformer protection can save need of adding breakers adjacent to transformers. Units have closing speeds ranging from 3.3 cycles at 15 kv and up to 19 cycles at 230 kv, and are available in voltage ratings from 15 through 230 kv, with momentary ratings of 20,000 and 40,000 amp. Two torque ratings are offered for the tripping mechanism: for 15 kv through 69 kv, torque is 1,000 in.-lb; for 115 kv through 230 kv, torque is 2,000 in.-lb. Switch is reset in open position with a hook stick or by a remote operating handle through a linkage. One, two, or three poles with identical closing times can be used.

I-T-E Circuit Breaker Co, Greensburg, Pa.

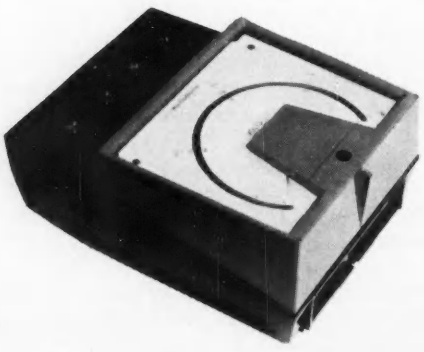


HV Sphere Gaps . . .

. . . are for measuring ac, dc and impulse voltages in dielectric materials and all kinds of insulated apparatus. They can also be utilized as protective devices to prevent excessively high voltage from being applied to the test specimen, to calibrate testing equipment and to check wave form of applied test voltages. Sphere gaps are available in diameters of 2.54, 6.25 (bench-mounted); 12.5, 25, 50, 75 and 100 cm (floor-mounted) and at sparkover ratings of 8.5 to 1,338 v. Gaps can be precisely adjusted and are equipped with a separate, current-limiting, non-inductive resistor assembly to limit current during sparkover. The non-inductive resistors are said to provide resistance of at least one ohm per volt of test voltage, and to have a curvature of within 1% of a true sphere. Units conform to AIEE specifications.

General Electric Co, Schenectady 5, N. Y.

Portable Ac, Dc Instruments...



. . . feature taut-band suspension, frictionless mechanisms—and since there is no wear between moving parts, maintenance is greatly reduced. The moving element of the taut-band system in these ammeters and voltmeters is suspended between bands of high-strength metal ribbon, supported on springs at each end. Scale length of the ammeters is 6 in., with scale arc of 100 deg; scale length of the voltmeters is 10½ in., with scale arc of 240 deg. Accuracy rating of the first units, available for shipment by September, will be within ½%.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

(*More New Equipment on page* 72)

SNAPACT

CONTROLLED ACTION

the key to safe and economical operation of load break oil switches

Here is what *controlled action* found only in SNAPACT, a new line of G&W load break oil switches, means to you----

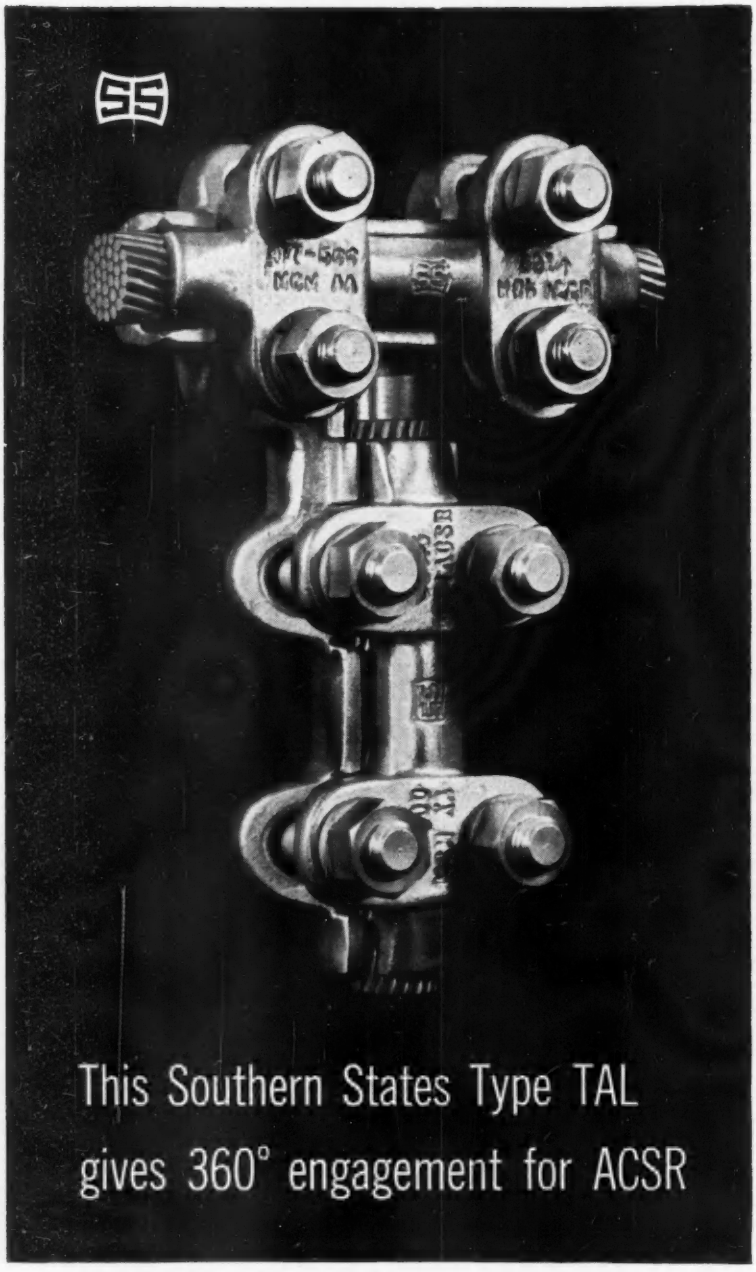
- SNAPACT *controlled action* offers fast, manually trip-free snap action in opening and closing of switch contacts.
- SNAPACT *controlled action* predetermines the velocity required to safely interrupt rated loads, eliminating the possibility of varying speeds inherent in manual operation.
- SNAPACT *controlled action* prevents reversing of throw between positions that is possible with manual operation.
- SNAPACT *controlled action* is contained in a detachable, portable operating unit which eliminates the need for conventional operating handles on the switches. It can be used on all SNAPACT switches, making possible substantial economies in system applications.
- SNAPACT *controlled action* switches can be used for many applications presently served by the Type RA switches. They are available in 5, 7.5, and 15 kv, full 400 ampere load break ratings.

Complete information about this new development is available through a nearby G&W representative or by writing to the G&W Electric Specialty Co., Dept. D.

G&W ELECTRIC SPECIALTY COMPANY
3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS
CANADIAN MFR. • POWERLITE DEVICES, LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards—inspired specialized design

D60-1



The unique design features of this connector reflect the engineering behind the entire Southern States line of fittings. For instance, to assure good electrical and mechanical characteristics, it provides independent clamping on run and tap conductors; its maximum contact engagement minimizes conductor clamping stresses; and conductor-fitting grooves limit cable distortion.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

Hi-Flash-Point Oil . . .

. . . has minimum flash-point specification of 295F (Cleveland Open Cup Method), with typical flash-point test values ranging from 300 to 305F. Diala Oil AX has been achieved without change in the accepted maximum viscosity specification of 60 SSU at 100F, as agreed upon by electrical equipment manufacturers. Diala AX is oxidation inhibited, resists sludging and lacquer formation at the higher operating temperatures. For the present, the higher minimum flash-point product will be available only east of the Rocky Mountains.
Shell Oil Co, 50 W 50 St, NYC

Potting Material . . .

. . . made with urethane foam is said to put a minimum of stress on the parts being potted—because the resulting urethane foam slowly and uniformly expands and hardens in the potting void. The nonfriable foam protects the parts embedded in it against shock, vibration, corrosion, and dampness. With a density of about 10-12 lb per cu ft, the material is about six to seven times lighter than conventional potting compounds. Furthermore, it is reported that for a given potting application, the urethane foam would cost appreciably less than many regular potting materials.
National Aniline Div, Allied Chemical Corp, NYC.

Dry-Type Transformers . . .

. . . utilize C_3F_8 (perfluoropropane) gas as insulating/cooling medium for sealed dry-type units, 300 kva and above, 15 kv and below to provide advantages over former nitrogen-filled types. Units are said to offer higher impulse levels, weigh about 2 tons less, and have smaller dimensions. Basic impulse level of the 15-kv, gas-filled unit is 95 kv, compared with standard impulse level of 50 kv for comparable 15-kv nitrogen-filled unit. Full-wave impulse levels compare favorably with liquid-filled distribution-type units' standards.
General Electric Co, Schenectady 5, N. Y.

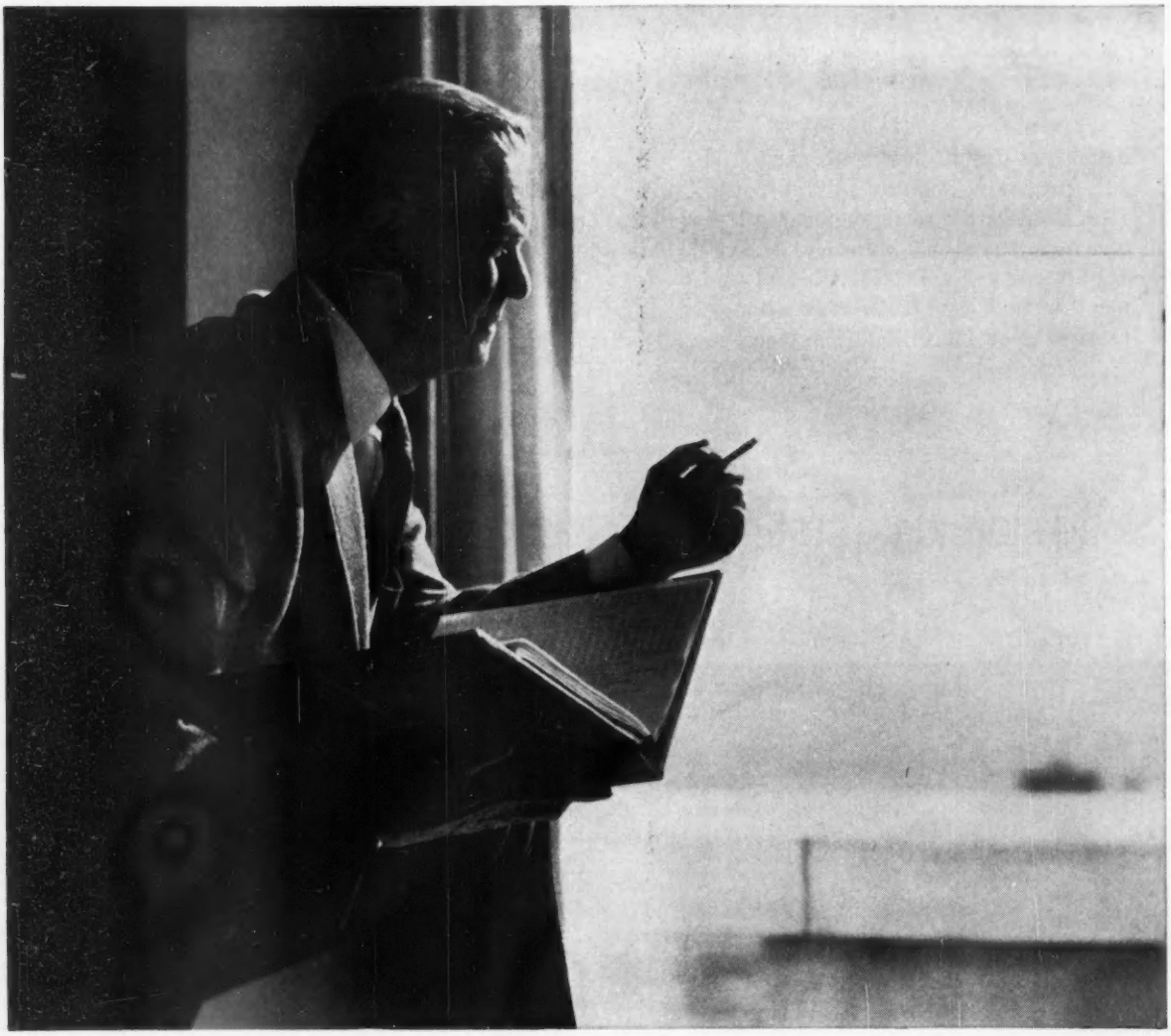
Enter the digital field with confidence: you can now get precise performance analysis data . . . protective monitoring for boilers, turbines, generators, transformers, etc. . . . with a solid state data system engineered by Leeds & Northrup to power plant standards. This system gives you the speed, accuracy, flexibility and — above all — the *reliability required by central station operation. Investigate* and confirm for yourself the benefits of L&N low-level measurement technology, L&N application know-how and L&N systems-engineered dependability. Contact your L&N Field Engineer, or 4938 Stenton Avenue, Philadelphia 44, Pa.

NEW | LN2000

Solid state data systems for central station operation

LEEDS & NORTHRUP *Pioneers in Precision*

When so much depends on so little, it pays to rely on the best



How long will utilities be able to buy the right kind of coal?

In the look-ahead world of electric utilities, 1981 can be here tomorrow morning.

The projected growth rate of electric needs makes it clear that the man who buys coal for a utility must pick his suppliers not only for what they can deliver now but for the next 20 or 30 years. He must be able to count on adequate reserves—of not just *coal*, but the right *kind* of coal. Coal that's free of hidden incremental costs that raise the invoice price with excessive coal handling, ash handling, equipment outages and freight charges on inerts. Coal that can deliver steam at the lowest possible cost.

To this utility man who lives partly in 1981, Island Creek offers a mighty reassuring picture of long-term quality and uniformity of supply. We'd welcome a discussion of your own searching look into that *very* near future. Write, wire or phone.

ISLAND CREEK Precisioneered Coal

You can depend on Island Creek . . . a career company dedicated to coal

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia • Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh

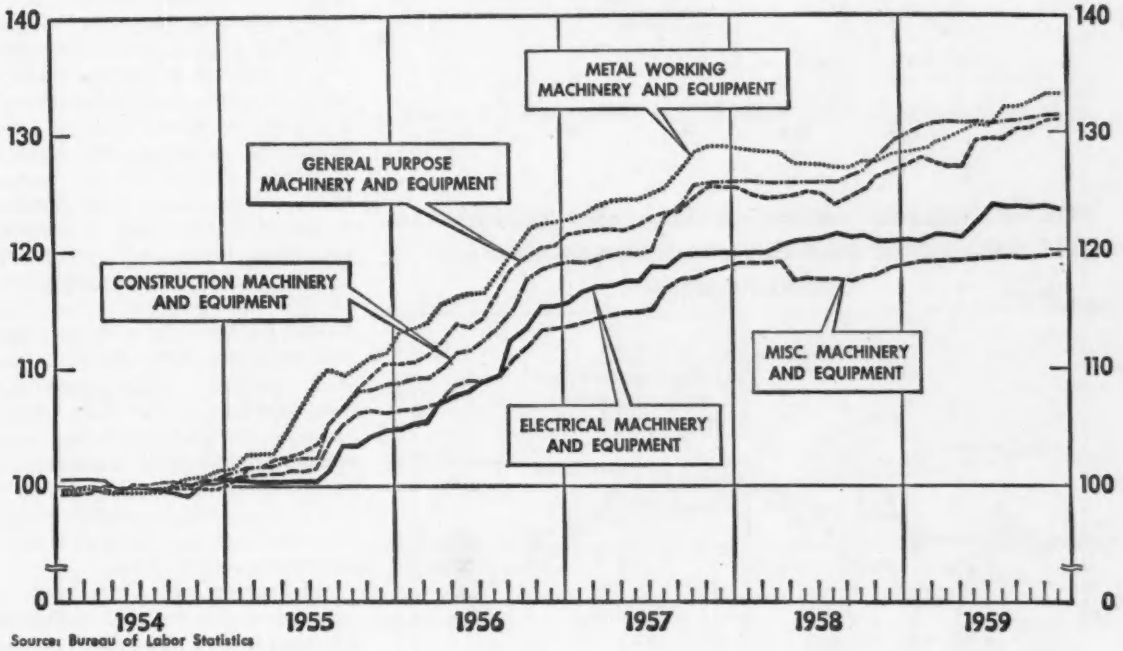
Electrical World

JUNE 12, 1961

Management Newsletter

FIG 1—Electrical vs Non-electrical Equipment Price Movements, 1954-1959

1954=100



Source: Bureau of Labor Statistics

Suppliers Report on Value and Price—Part II

Sentencing of 29 electrical equipment manufacturers for violation of antitrust laws against price fixing has created the greatest feeling of uncertainty and puzzlement the US electrical utility industry has experienced since the Public Utility Holding Company Act. "Were we overcharged?" "How do we find out?" These are two of the countless questions that can be heard any time, in any part of the country.

Soon after the sentencing, four of the manufacturers set out to establish some kind of an anchor point for the extremely complex considerations that were bound to come as utilities began the unappetizing but necessary chore of searching for possible overcharges. The manufacturers, General Electric Co, Westinghouse Electric Corp, Allis-Chalmers Mfg Co, and Ingersoll-Rand Co, jointly did two things. First they reached agreement to share liability, and then they conducted cooperative research to show price trends of heavy electrical equipment and orient them with other indexes. Condensed results of their study are on these pages and in Part 1 last week (EW, June 5, p 83).

Top executives of the manufacturing companies have carried their study to some utilities now, and report a generally favorable reception. But still there are more

FIG 2—Electrical Equipment Order Price Index (Solid Line) vs Electric Light and Power Industry Price Indexes

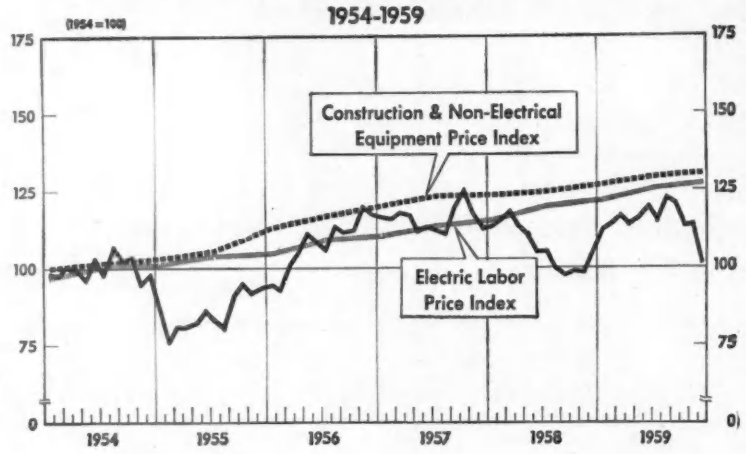


FIG 3—Electrical Equipment Order Price Index (Solid Line) vs BLS Non-electrical Machinery and Equipment Price Index

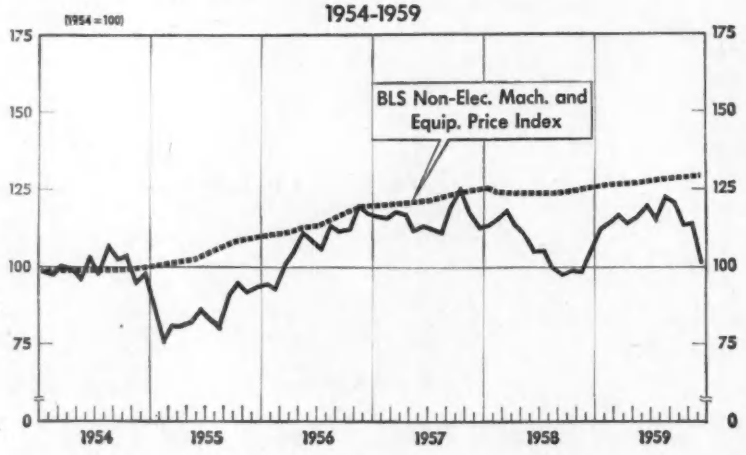
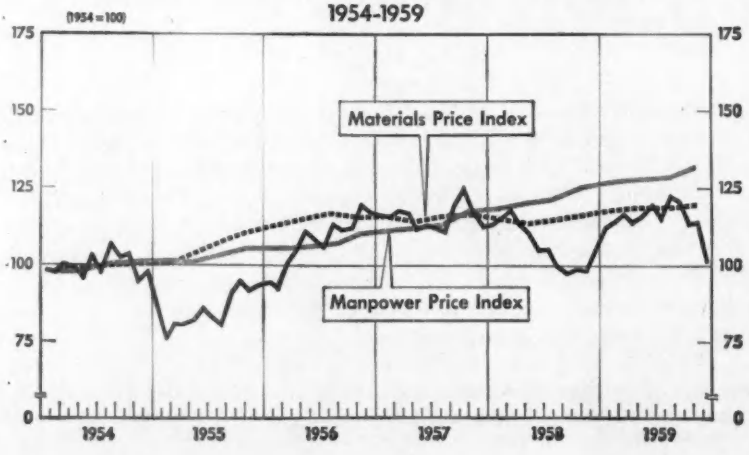


FIG 4—Electrical Equipment Order Price Index (Solid Line) vs Price Indexes of Manpower and Materials Used



questions asked than are answered by the price and value study. Many believe these answers are in the data behind the study. A further breakdown of the data has not been made available, probably because of pending litigation.

The report, however, is not intended to be a substitute for detailed discussions with customers about specific purchases, the manufacturers point out. Its avowed purpose is to provide a background for such discussions—to give perspective to price movements.

For example, the chart on the preceding page (Fig 1) shows the relative position or behavior of electrical machinery and equipment prices to four other product groups. In this chart all of the lines, including electrical machinery and equipment, are plotted from the Bureau of Labor Statistics' (BLS) Wholesale Price Index. All five curves flattened out in the recession years of 1955 and 1957-58, and reacted to cost pressures from rising labor and materials expenses over the study period, the report points out. The solid line in this chart represents all electrical machinery and equipment while solid lines in other charts represent selected products.

All price indexes resulting from the price study are compared with three price trends:

(1) Price indexes of labor and of the construction and non-electrical equipment used by the electric utility industry (Source: Handy-Whitman);

(2) Non-electrical machinery and equipment price index, which is the weighed composite of the four non-electrical BLS categories in Fig 1 (Source: Bureau of Labor Statistics);

(3) Price indexes for materials and manpower used in the production of the products covered by the related order price index (Source: the electrical manufacturers).

Basic data for the price study were abstracted from the corporate records of the four manufacturers, and were compiled from actual order prices, not "book" prices.

The manufacturers point out that they set exacting conditions of objectivity, and retained certified public accountants, an independent research firm, and a prominent statistical consultant to be certain the conditions of objectivity would be maintained.

For purposes of the study, the manufacturers classified four major product groups as "Electrical Equipment." This includes outdoor oil and air circuit breakers, power switching equipment, power switchgear assemblies, and power transformers (see charts on page 76).

The manufacturers explain the sharp peaks and valleys of the electrical equipment price pattern (solid line) by stating: ". . . month-to-month variations . . . are indicative of a market highly responsive to delicate shifts in supply and demand." The charts show that prices of these products were low in recession periods, and rose again ". . . as the backlog of unfilled orders increased, and as the pressure of increased costs forced manufacturers to raise prices."

Larger products covered in the study (land steam condensers and steam turbine-generators) are shown with quarterly changes because of the small number of individual transactions. Figs 5 and 6 are related to prices of land steam condensers with 5,000 sq ft of condensing area and over, and presence or absence of tubes were taken into consideration in the construction of the price index. Again, fluctuations are attributed to supply and demand and cost pressures.

Steam turbine-generators (Figs 7, 8 and 9) include all land turbine-generators of 5 Mw or more. Because of the increasing size of the average turbine-generator, an adjustment similar to computing the price of a turbine-generator in dollars-per-kw of rated capacity was made to account for the effects of larger sizes on prices. Except for this adjustment all units were treated alike, so the average 1959 turbine-generator, although it was considerably improved over the average 1954 unit, shows in the report as a 1954 type.

The manufacturers point out also that the index is based on *order* prices and does not take into account price adjustments resulting from the term of contracts or negotiated with the customers.

The index (solid line) shows a lag in price increases in 1954-55 which the manufacturers attribute to an extremely low backlog of orders in relation to their factory capacity. Then customers' plans for new generating capacity pro-

FIG 5—Land Steam Condenser Order Price Index (Solid Line) vs Electric Light and Power Industry Price Indexes

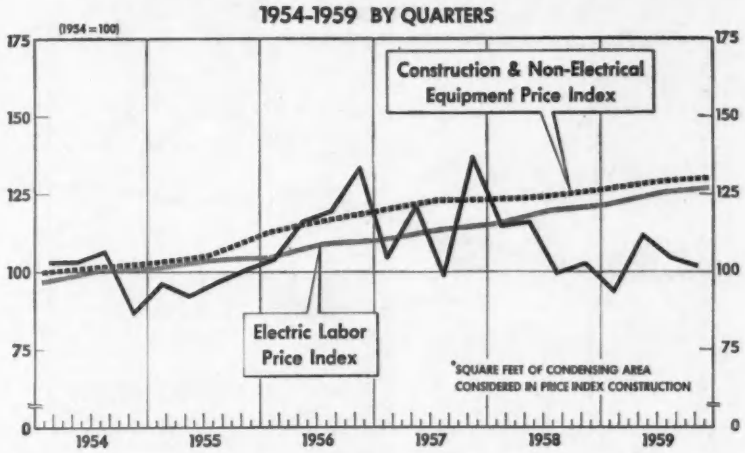


FIG 6—Land Steam Condenser Order Price Index (Solid Line) vs Price Indexes of Manpower and Materials Used

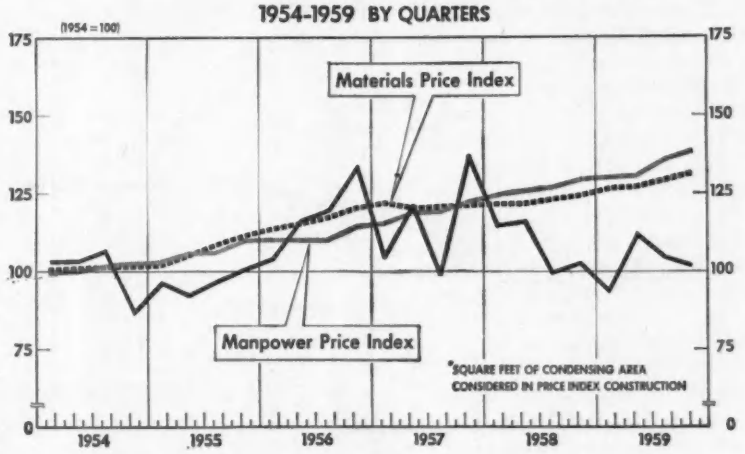


FIG 7—Steam Turbine-Generator Order Price Index (Solid Line) vs Electric Light and Power Industry Price Indexes

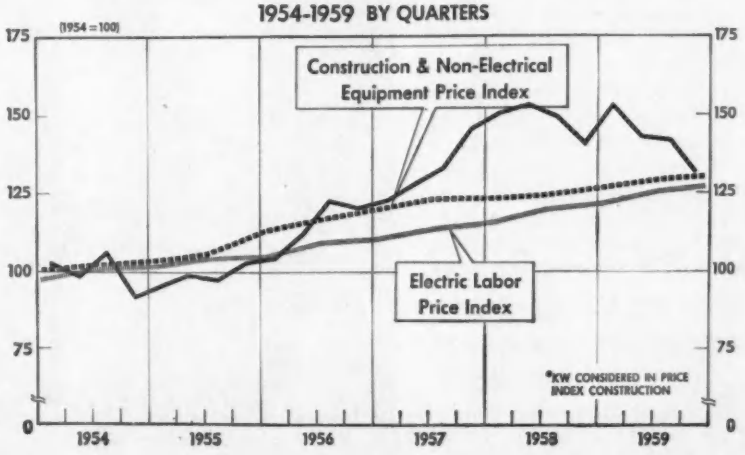


FIG 8—Steam Turbine-Generator Order Price Index (Solid Line) vs BLS Non-electrical Machinery and Equipment Price Index

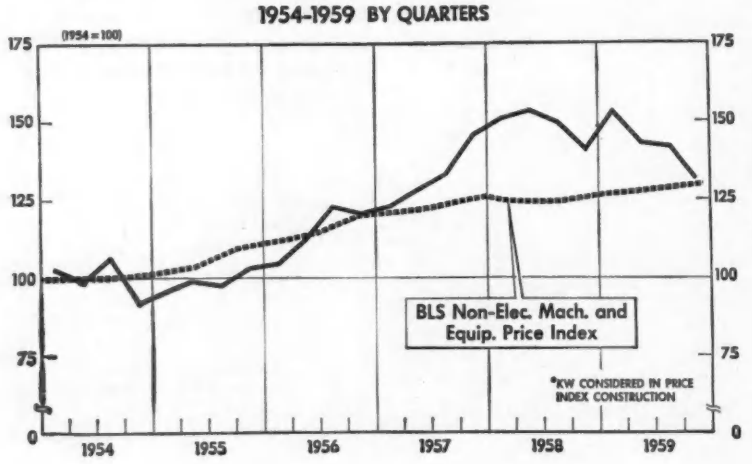


FIG 9—Steam Turbine-Generator Order Price Index (Solid Line) vs Price Indexes of Manpower and Materials Used

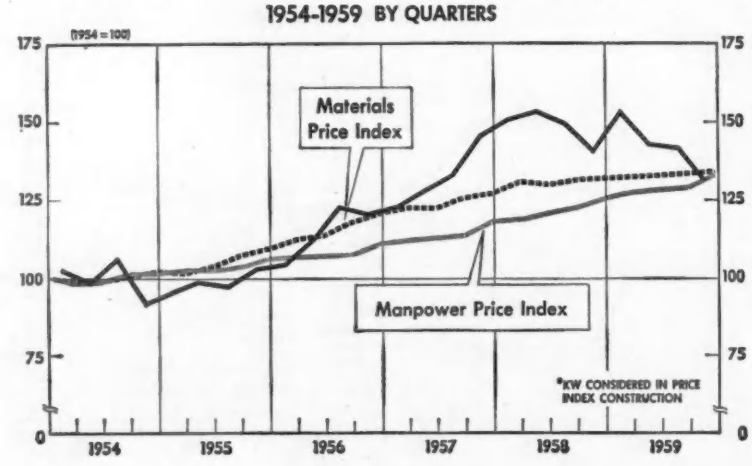
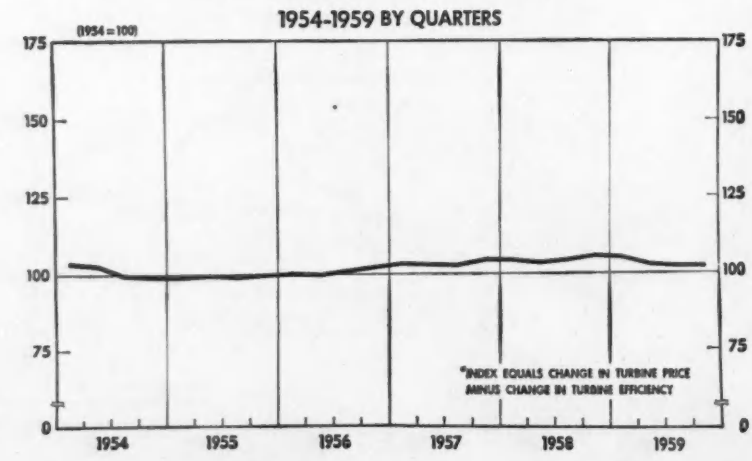


FIG 10—Impact of Turbine-Generator Prices and Efficiencies on Cost of Generating Electricity



duced a large volume of orders and manufacturers say prices were "belatedly" raised accordingly.

One of the more significant points made by the price study is the impact of turbine-generator prices and efficiencies on the cost of generating electricity (Fig 10). In this portion of the study, turbine-generator price movements are considered in relation to what the customers received for the prices they paid. Changes in the cost of generating electricity are plotted as functions of changes in turbine-generator prices and changes in heat rate. All other plant variables are held constant.

As shown on the chart, this portion of the cost of generating electricity became only 2.7% higher, based on 1959 turbine-generator prices and efficiencies, than it was in 1954. In preparing the chart, one-half of the savings resulting from improved heat rates were subtracted from increased operating costs caused by higher turbine-generator prices. "If the effect of increases in turbine-generator prices had been completely offset by one-half of the increased efficiency," the manufacturers report, "then the index would stay at 100."

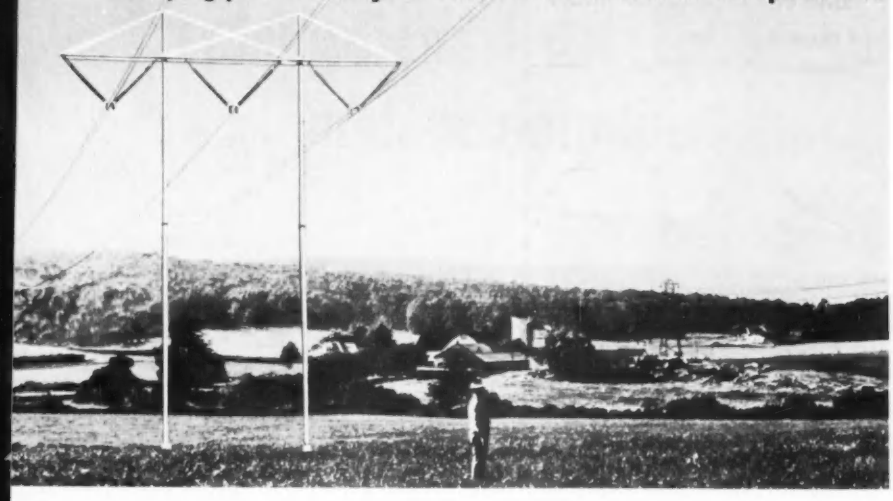
The report says that the 2.7% increase has been more than offset by savings to the electric utility industry from other improvements in technology.

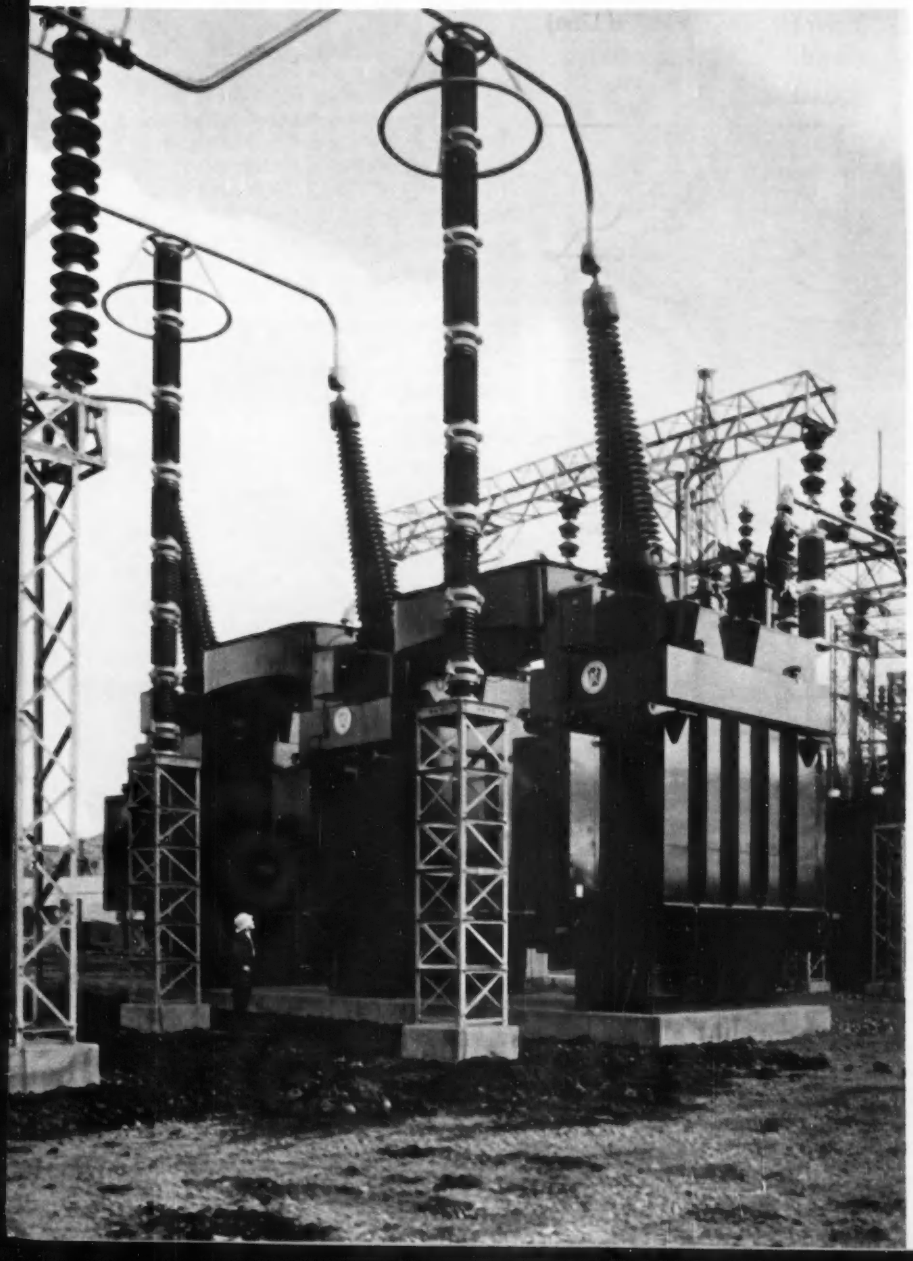
Generally speaking, the report as a whole reveals price increases when the beginning and the end of the study period are compared. Turbine-generator prices, at 42.8%, increased the most, electrical equipment was second at 15.1%, and land steam condensers low at 3.1%.

It can be anticipated that most of the inevitable questions that will arise as the report is shown will be concerned with the sharp vertical swings in the solid black lines. This is where discussions between the four manufacturers and their customers take over where the price study leaves off. The timetable of utility purchases compared with peaks and valleys in the solid black lines will require more explanation, and the manufacturers have said they are prepared to give it in detailed discussions.

At any rate, the manufacturers have done what they set out to do with the price study. They have provided a beginning point.

Helping pave the way for tomorrow's "Electrical Turnpikes"...





460-kv Pennsylvania transformers now in service on Penelec's EHV line

The 460,000-volt transformers provided by Pennsylvania Transformer Division, McGraw-Edison Company for Pennsylvania Electric Company's pioneering transmission line are the culmination of a million-dollar investment by Pennsylvania in the development of extra-high-voltage transforming equipment. During the next two years, operating data obtained in cooperation with Penelec will help pave the way for eventual EHV "electrical turnpikes" over which large blocks of power can be transmitted economically.

Located at the Saxton end of the 13-mile Penelec line, the bank of Pennsylvania autotransformers is rated 60,000 kva, 460-115 kv. The installation consists of three 20,000-kva single-phase units.

Although now in the realm of the "spectacular," extra-high-voltage installations such as this undoubtedly will play an important part in America's future growth. Pennsylvania Transformer is grateful for the opportunity to help lay a solid groundwork for that future by participating in the Penelec project.

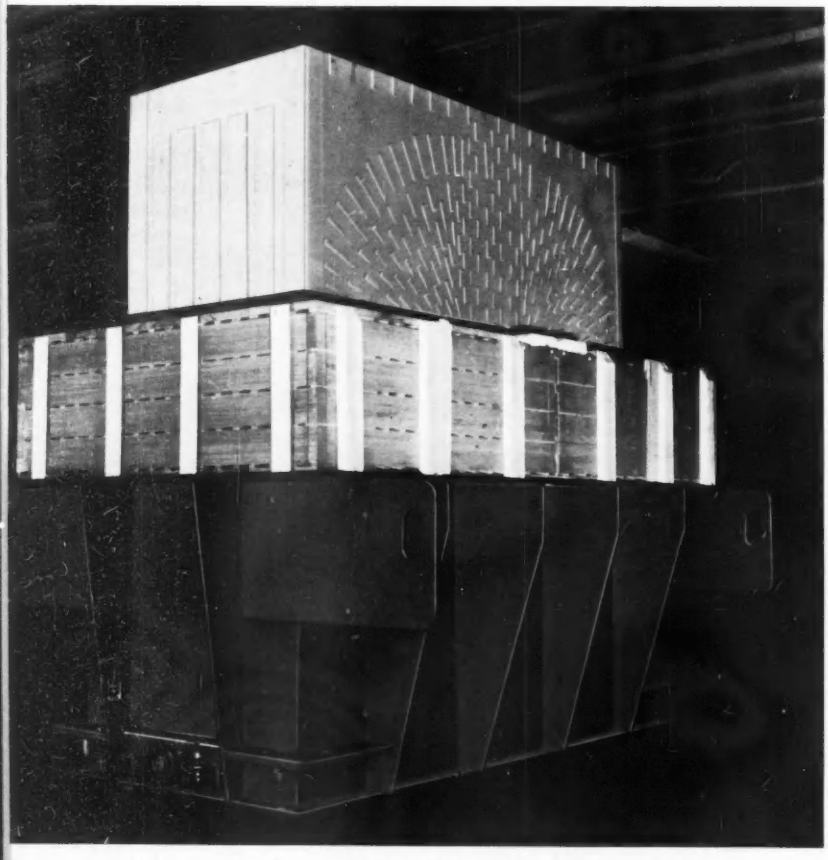
The 460-kv transformers were built with Pennsylvania's basic shell-form insulation system — service-proved in Pennsylvania Contour Design Transformers. For details, write for Catalog P-560.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
CANONSBURG, PA.

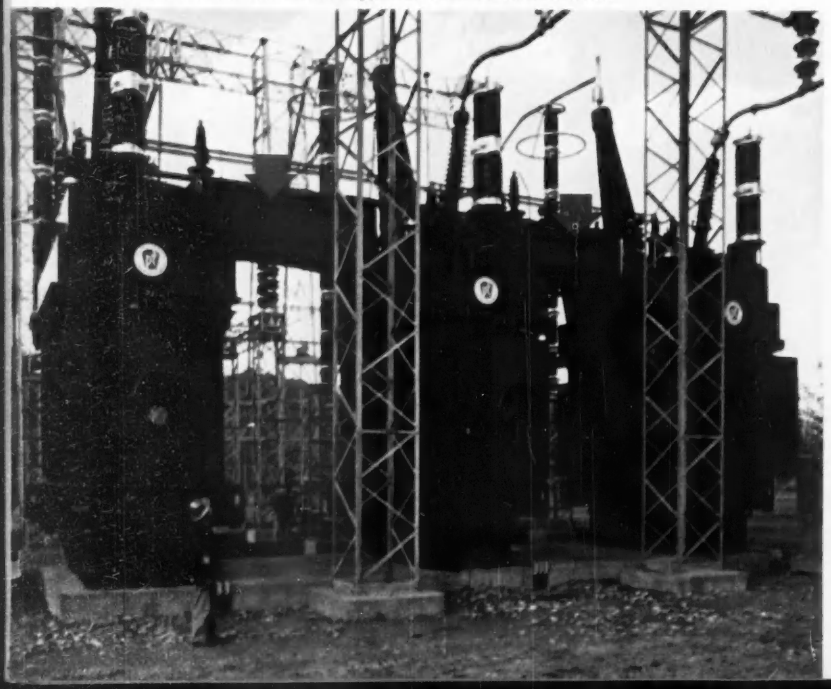
See other side for design details

For Penelec's **EHV** Line . . .

Pennsylvania builds 460-kv transformers with basic shell-form insulation system



460-kv core-and-coil assembly, in bottom section of tank.



In designing transformers for Pennsylvania Electric Company's 460-kv transmission line, Pennsylvania Transformer's engineers met the rigid extra-high-voltage insulation requirements with the same basic insulation system as that used in the company's "lower-voltage" shell-form transformers, which have been manufactured for voltages up to 345 kv. The feasibility of this design for EHV applications has been test-proved in experimental efforts dating back several years. At its plant in Canonsburg, Pennsylvania designed and built an experimental 460-kv unit that served as a prototype for transformers now on the Penelec line. Special testing equipment—including highly sensitive corona-detecting apparatus—provided an accurate guide to refinements in design.

new type of oil-expansion tanks

Among the special design features of Pennsylvania's 460-kv transformers are diaphragm-sealed oil-expansion tanks. Although the expansion tanks themselves are free-breathing, synthetic rubber diaphragms inside the tanks seal the transformer oil from the atmosphere while permitting the oil to expand or contract as temperature rises or falls.

Two internally divided oil-expansion tanks are mounted between the transformers (see arrows), thus utilizing the space resulting from high-voltage bushing phase clearances. This avoided adding to the overall dimensions of the installation.

• • •

Transformers such as the 460-kv units for Penelec's EHV line are possible only because of extensive experience in the design and manufacture of less "spectacular" transformers of widely varying types and sizes. Conversely, data obtained as a result of the Penelec installation will be an important supplement to Pennsylvania's overall research and development program.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
CANONSBURG, PA.

See other side for installation story

Commercial Electric Heating Snowballs in Georgia

2,000 installations in state, Atlanta leading cities with three; Merchandise Mart's 1-million sq ft heated, cooled electrically, expected demand 6,450 kw

Georgia has 2,000 electrically heated commercial buildings, more than any other state, and the number is growing at the rate of 55 buildings a month. Topping the list are three Atlanta buildings, two new ones and one that has been converted to electric heating.

Atlanta's Merchandise Mart, which will be completed this month, is reputed to be the world's largest all-electric building. It has one million square feet heated and cooled electrically. The building has a total connected load of 11,035 kw and is expected to have a demand of 6,450 kw.

This load includes:

440—6-kw heat pumps	2,450 kw
60—5-kw strip heaters	300 kw
20—30-kw strip heaters	600 kw
20—35-hp air conditioning compressors	373 kw
20—5-hp auxiliaries	100 kw
1—30-hp (25 ton) air conditioner	22.5 kw
1—5.75-hp (5 ton) air conditioner	4.3 kw
3—auxiliary pumps	108 kw

The new 22-story Georgia Power Co building has a floor area of 478,242 sq ft, including garage and two basements. It has a total connected load of 8,000 kw and an estimated demand of 4,305 kw. There are 91 kw of lighting and 87 kw of resistance heating per floor.

Heat for the building is provided through three sepa-

MERCHANDISE MART in Atlanta is reportedly world's largest electrically heated building with over one million sq ft

BANK BUILDING constructed in 1892 has been converted to electric heat, replacing old steam heating systems

rate mediums. As the conditioned air leaves the offices it passes through the void space in the ceiling, picking up heat from the recessed lighting. The lighting generates enough heat so that during 90% of the winter, no other heat will be required during the time the lights are on. From this fact came the expression "heating with light".

If the weather gets cold enough the thermostats turn on the electric resistance heaters located in each air handling system. At night and on weekends the lighting load is at a minimum and these heating units provide the necessary heat for the building. During short periods when temperatures drop to 40F and lower the 500-w resistance heaters in the exterior walls, below the windows, come on automatically to keep the windows from sweating.

The building is lighted to the new Illuminating Engineering Society standards for the seeing tasks to be performed in each area. Lighting levels range from the 200 ft-c in drafting rooms and other areas of severe seeing tasks, to 150 ft-c for more normal office work and 100 ft-c for less severe seeing tasks. Lighting averages eight w per sq ft, including corridors, toilets and other space.

The Trust Company of Georgia Building, which was built in 1892, installed a modern electric heating system to replace an old central steam radiator system. The old one-pipe steam heating system began a series of breakdowns in 1958. Trust Company officials ordered an initial cost analysis on modern heating systems. At the same time, Georgia Power Co made operating cost studies. As a result of these analyses, the Trust Company installed 900-kw of electric heating. To meet the requirements of the greatly varying office space dimensions, cabinet convectors were used predominantly, while baseboard heaters were installed in some areas.

Rate, Hard Sell Have Effects

There are two reasons why electric heating in commercial buildings is snowballing in Georgia. First is a two-part rate for general service use, which is applied to all commercial customers. Second is the research program which has been directed at the accumulation of data on competitive costs of gas and electric service for various purposes and the effective use of this information in a hard selling program by well-trained graduate engineers.

Part one of the two-part rate is based on a 30-minute integrated demand with the usual rate steps and a proviso that all energy in excess of 200 hours use of demand will be billed at one cent per kwhr. Part two of the rate was originally designed specifically to encourage commercial electric cooking. It provides that ". . . any customer taking all of his service through one meter and who has not less than 40% of his total connected load in active cooking and heating equipment may at his option have his billing demand determined by load count rather than by measured demand". When a load count is made the rate stipulates that all cooking, heating and air conditioning loads be omitted, and only 80% of the lighting and 50% of the miscellaneous motor load is counted for billing purposes. The minimum charge is $1/month/kw installed.

When this rate was written over 20 years ago, the word "heating" meant water heating, not space heating. Georgia Power Co has interpreted the clause to suit modern day use, and now permits space heating to "qualify" the customer for counted demand, provided he fully air conditions electrically the same area that is electrically heated. This results in a balanced and high load factor.

Every building of any size that has been built in Georgia Power Company's service area in the past six or seven years has been the scene of a real battle with the gas company. They want the total load, except light. Georgia Power Co goes after all the load, including lighting.

Experience has been that if any part of the load is lost to gas, all is lost except lighting. That is why Georgia Power goes after the total load. Sales people are trained that way. They are given special recognition only for total-electric jobs. They use Georgia Power's unique rate in getting total electric jobs.

Can Give the 'Better Deal'

Here is how it works. When dealing with a customer who is building a new building, the operating cost is quoted for all electric service, omitting heating and cooking, on the regular measured demand rate. Then it is quoted separately for the incremental operating cost of heating and/or cooking with the entire load based on the counted demand rate. Incrementally, the cost of heating and cooking is so small that it is difficult to make the customer believe it.

This raises the question, why go after the heating and cooking load? Georgia Power's answer is "we cannot get just the load we want, leaving the rest of it to the gas company. We can give a better deal on the entire package and we are after the entire package". The reason the additional quoted cost for heating appears so low is because the customer is getting a lower rate for his air conditioning, and even his lights, when he heats electrically, which he cannot get if he does not go all electric and qualify for the counted demand rate. The customer still pays an average rate of not less than 1.25 cents/kwhr.

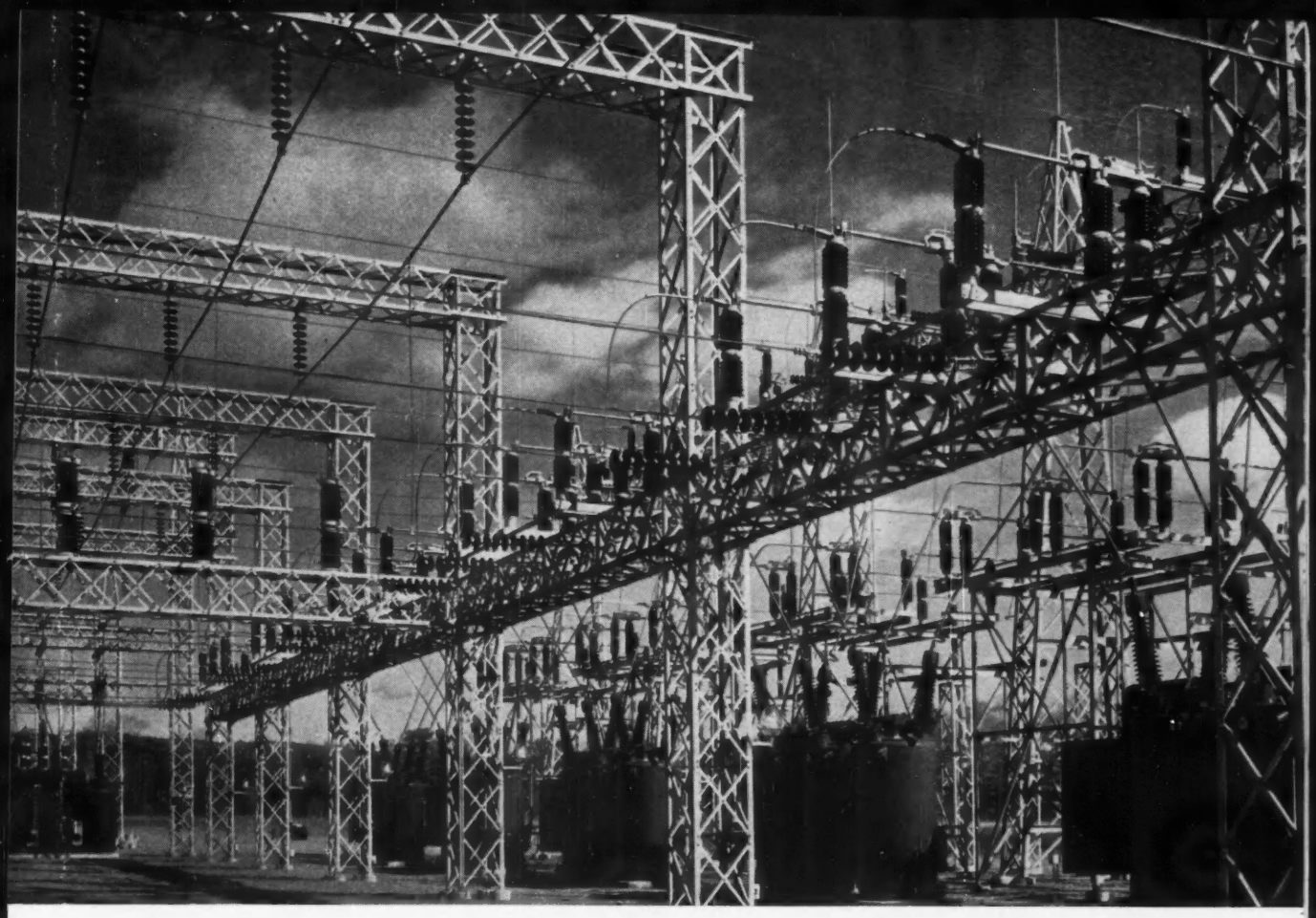
The balanced load and high load factor that results when the total load is obtained justifies the cost concessions that have been so successful in getting the whole package.

To back up the advantages of this Total Electric rate, Georgia Power Co has conducted a research program to get actual operating costs for commercial buildings where:

1. All services are electric.
2. Only lighting is electric and all other loads are served with gas.

Submetering was installed on the various services of different types of customers. Data were obtained on gas costs, electric costs and water costs. This research work provided data that was not otherwise available. Then, when the data were obtained the ammunition was given to the sales force and they took it to customers and prospective customers and to their engineers. The engineers want the facts.

Georgia Power Co has spent a lot of money to refute the gas industry's claims on costs of operating air conditioning and heating. The results speak for themselves. Georgia is going total electric.



Corrosion-resistance of Acco *Aluminized* Wire provides significant economies

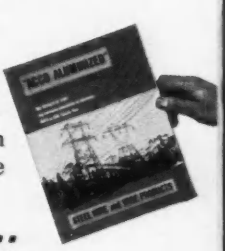
You can minimize losses due to corrosion, through the use of ACCO *Aluminized* strand for guys, messengers, and overhead ground wires, and in ACSR core wire. At PAGE, commercially pure aluminum is bonded to the steel wire by a patented hot-dip method that insures a tight bond of aluminum to steel. You get the strength of the highest quality steel wire combined with the corrosion resistance of commercially pure aluminum.

Millions of feet of aluminized strand and ACSR conductor with aluminized core in service in all parts of the country attest to the superiority of PAGE ACCO *Aluminized* Wire.

Strand • PAGE *Aluminized* Strand meets the physical properties of ASTM Spec. A-122-58 and A-363-58. Available in all sizes and grades.

Core Wire • for ACSR conductor. ACCO *Aluminized* Core Wire meets the requirements of ASTM Spec. 341-59T. In addition to vastly superior corrosion resistance, the danger of electrolytic action is eliminated when you use aluminized core wire.

When you specify PAGE *Aluminized*, you get not only the superior corrosion resistance of aluminum but also the highest quality steel wire—produced by a manufacturer with fifty years experience in the development and manufacture of wire for utility service.



Get the complete story...

For details, write us at Monessen, Pa., for a copy of Booklet DH537

PAGE *the source for answers to wire problems*

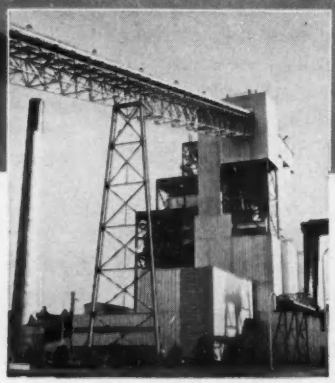
ACCO

PAGE STEEL AND WIRE DIVISION • AMERICAN CHAIN & CABLE COMPANY, INC.

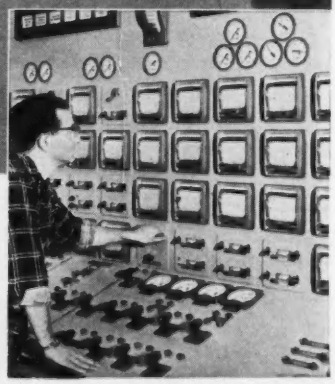
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

this is the **complete** Foxboro Control Panel for

FOXBORO BOILER TURBINE CONTROL panel at Merrimack Station, Bow, N. H. includes complete combustion, feed water, and steam temperature control systems. All pneumatic instruments are located on vertical portion of panel — electrical switches and dials are on integral operating console, resulting in simpler back-of-panel piping and wiring.

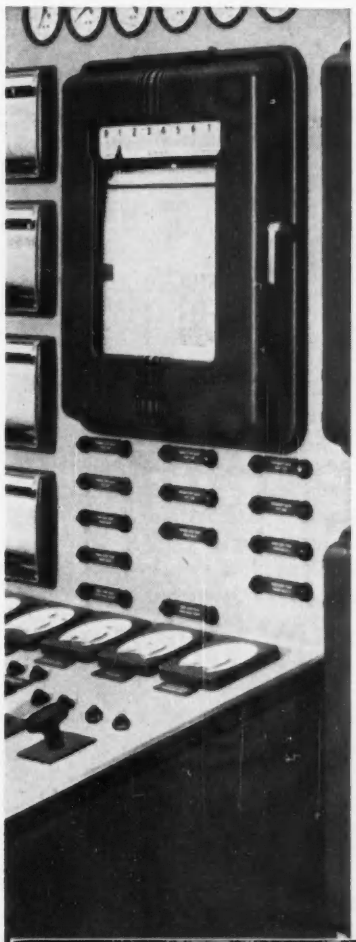


PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE'S new cyclone-fired boiler plant at Bow, N. H., generates 815,000 lb./hr. of 1875 psi steam at 1005 F.



FOXBORO CONSOTROL RECORDERS have full-scale 4-inch charts — the same scale as large case instruments. Note — operator's console is an integral part of Foxboro control panel.

Boiler Turbine a 100,000 kw Steam Station



compact Consotrol* instruments help Public Service of New Hampshire slash control costs of new Merrimack Station

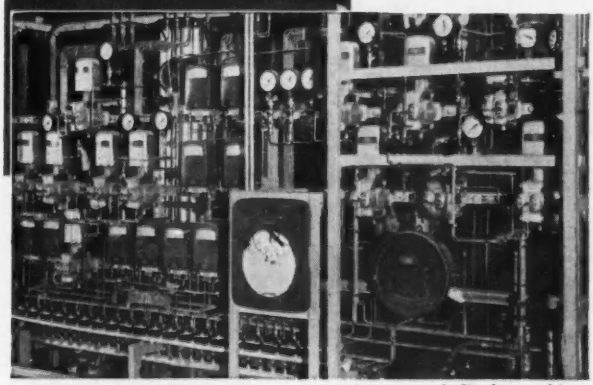
A compact control center which completely eliminated the need for a separate operator's console resulted in many significant savings for the Public Service Company of New Hampshire.

By using small-case Foxboro Consotrol control stations, the recording panel and the operator's console were combined in one integral unit. Results: plant operation is more efficient, because recorded variables and control switches are all *directly* in front of the operator. Total installed cost was reduced because the need and the expense of transmitting variables and control signals between the panel and the console were eliminated.

In addition, valuable control room space was saved, states David Merrill, Station Superintendent.

If you're interested in better control — at lower cost — investigate the Consotrol story. Your nearby Foxboro Field Engineer will gladly give complete details. Write for Bulletin 13-18. The Foxboro Company, 246 Norfolk Street, Foxboro, Mass.

Reg. U. S. Pat. Off.



FOXBORO INDICATING pressure transmitters, and Foxboro d/p Cell* flow transmitters, located on rack next to boiler, transmit boiler measurements to central control panel. Station design allows for 3 additional boiler units.

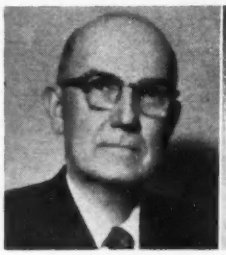
Reg. U. S. Pat. Off.

FOXBORO

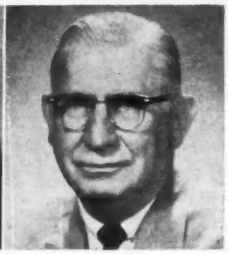
REG. U. S. PAT. OFF.

News About People

Chairman, President Elected



THOMAS



FISHER

Texas Electric Service Co has elected J. B. Thomas as chairman and Beeman Fisher as president, general manager, and chief executive officer.

Thomas has been president and general manager for ten years. He was instrumental in the development of the company. He has been a vice president, executive vice president, and general manager.

Since 1938 Fisher has been assistant to the president, vice president, and, most recently, executive vice president.

Ohio Utility Appoints Executive VP, Two Vice Presidents

McNEALEY

STREIT

GREEN

J. Lawrence McNealey has become executive vice president of Columbus & Southern Ohio Electric Co. He was formerly vice president-operations.

Frank H. Streit was elected vice president-electrical operations, and Arthur Green became vice president-controller.

Streit had been production department manager since 1954. Green has been controller since 1950.

Johnson Made AEP Service Corp VP

American Electric Power Service Corp, New York, has promoted Harold R. Johnson to a vice presidency.

Johnson has directed the public relations and advertising activities of the seven-state AEP System for the past nine years. He was previously director of the public relations department of Ohio Power Co, a major operating company of the AEP System. He was the founder of the Ohio company's department.

◀ JOHNSON

Con Edison Picks Anderson, Beattie to Be Vice Presidents

ANDERSON

BEATTIE

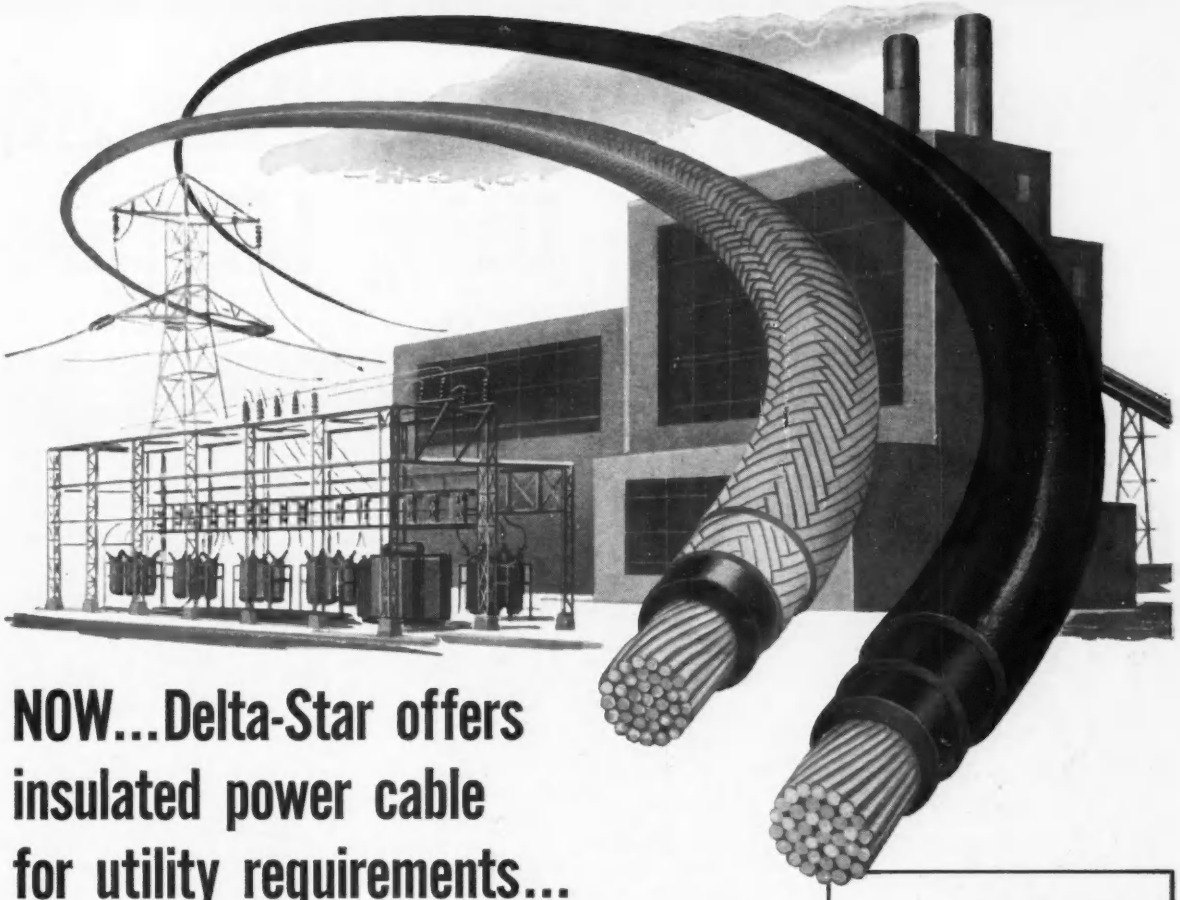
Arthur N. Anderson and William C. Beattie have stepped into vice presidencies at Consolidated Edison Co of New York, Inc.

Anderson will be responsible for construction activity in the streets and for transportation throughout the Con Ed service area, except for Staten Island. Beattie will be responsible for electric, gas and steam production facilities.

Anderson has been an assistant vice president since 1958, Beattie since 1959.

Francis A. Going was elected auditor. He has been with the company since 1922.

(*More News About People on page* 90)



NOW...Delta-Star offers insulated power cable for utility requirements...

Delta-Star has added NATIONAL ELECTRIC insulated power and control cable to their broad line of quality products for transmission and distribution of electric power. NATIONAL ELECTRIC, a division of the H. K. PORTER COMPANY, INC., has thirty years experience in the wire and cable business and produces many cable items for utility requirements.

Now utilities can buy cable, together with all cable accessories, direct from the manufacturer. For generating stations, Delta-Star can supply power cables for up to 28,000 volts, including rubber insulated, varnished cambric, asbestos, thermoplastic, silicone rubber and interlocked armor cable. For distribution lines there are rubber insulated, rubber and lead and pre-assembled aerial cable. Special cables include submarine, mining machine, borehole and portable rubber cord and cable.

Cable accessory items available from Delta-Star include potheads, expanded metal or ladder-type cable support systems, power connectors, spool cable supports, plugs and receptacles. For complete data on utility cable and cable accessories, write to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton Street, Chicago 12, Illinois.*

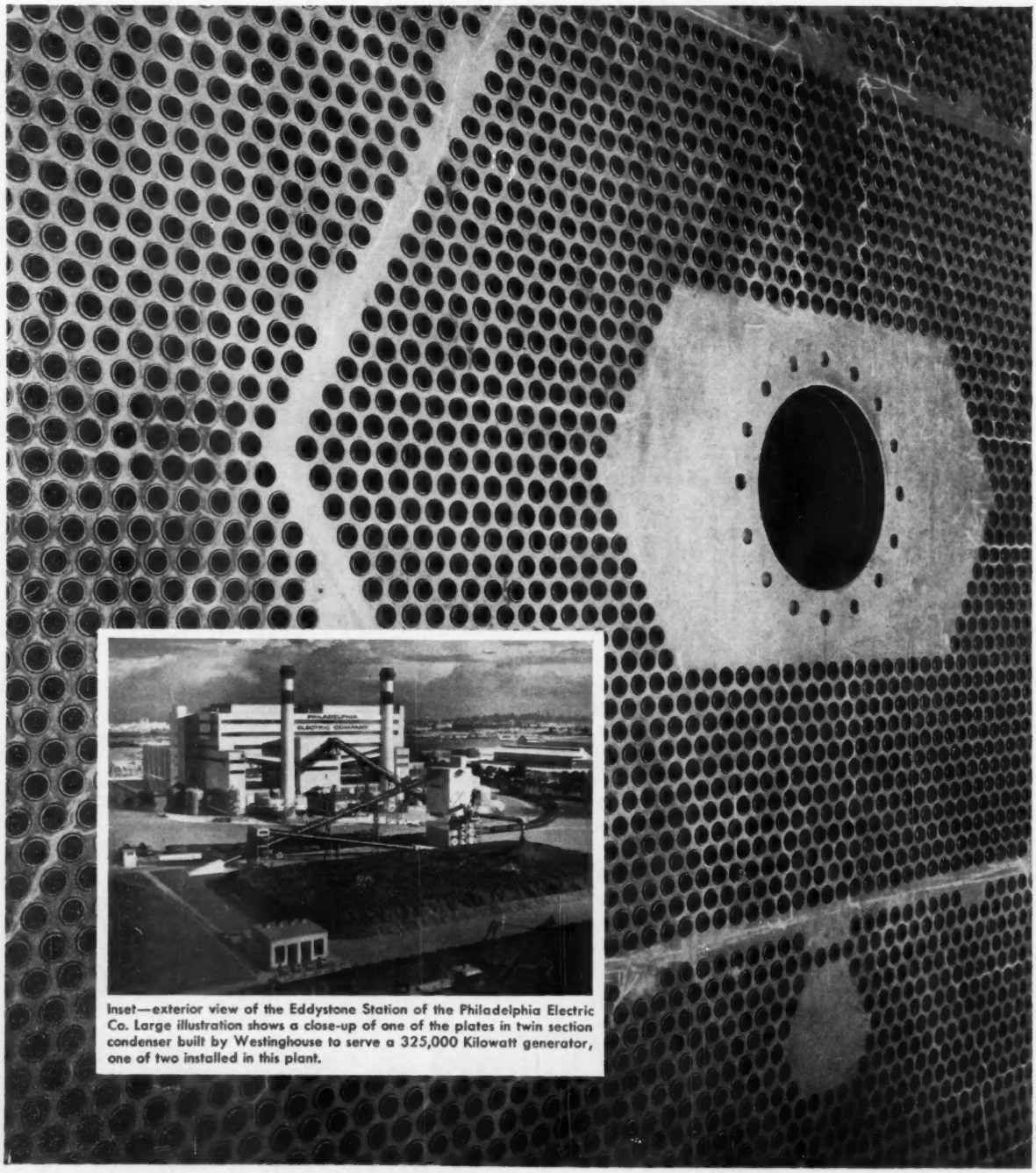
Where the HEAT'S ON or the load is high...

Nepco-Sil silicone rubber insulated power and control cable from Delta-Star is ideal for installations where heat is extreme, due to load or environmental conditions. Silicone rubber insulation as compounded by the NATIONAL ELECTRIC DIVISION has the acknowledged insulating properties of rubber together with the stability of silicone. It provides resistance to aging, retention of physical, chemical and dielectric properties far above the limits of organic rubbers. For complete data on Nepco-Sil cables, write to Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton Street, Chicago 12, Illinois.

DELTA-STAR ELECTRIC DIVISION PORTER **H. K. PORTER COMPANY, INC.**

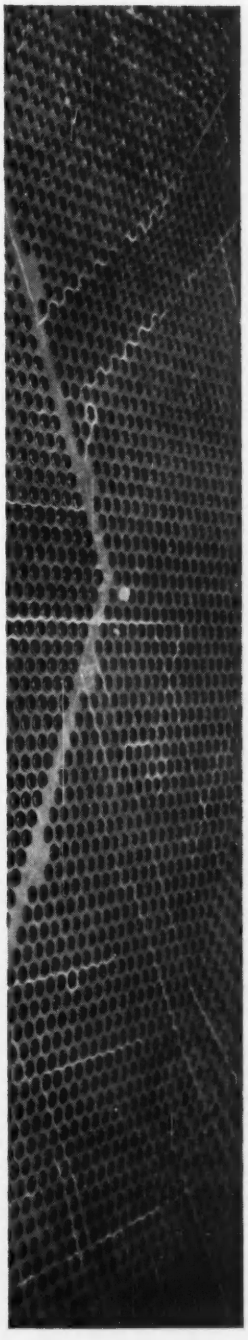
PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

New Temperature and Pressure Generator—Using 162 Tons



Inset—exterior view of the Eddystone Station of the Philadelphia Electric Co. Large illustration shows a close-up of one of the plates in twin section condenser built by Westinghouse to serve a 325,000 Kilowatt generator, one of two installed in this plant.

Records Set by Steam Turbine of Revere Condenser Tubes



Westinghouse-Built Twin Section Condenser Installed at Eddystone Station of the Philadelphia Electric Co.

No. 1 steam turbine-generator in the new Eddystone Station of the Philadelphia Electric Company is setting new records for pressure and temperature with initial steam throttle conditions of 5000 psi and 1200°F.

Helping to assure this efficiency is a 150,000 sq. ft. surface condenser . . . equipped with over 162 tons of Revere Tubes. In the main condenser area, 23,075 Revere Admiralty Tubes—¾″ O.D. x 18 BWG x 30′ long are used. Because of ammonia in the exhaust steam, the air cooling section uses Admiralty Bi-Metal Tubes. In this section of the Westinghouse Surface Unit, 2,745 tubes are installed, Type 316 welded stainless steel, .024″ wall, drawn over Admiralty with an .025″ wall.

Here at Eddystone, as in so many generating plants, varying operating conditions call for specific types of tubes best-suited to meet the specific conditions. Revere, with its wide experience in these matters, was called upon to recommend the proper type of tubes.

This same wide choice of materials and construction, combined with unequalled experience, makes Revere your best source of tubes for original equipment or replacement. Why not put this knowledge and the Industry's widest line of tube materials and types to work before you make the final selection of tubes and plates for your equipment? You can bring them to bear on your problems by calling the nearest Revere Sales Office.

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COPPER AND BRASS INCORPORATED

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INTEGRAL FINNED TUBE • BIMETAL TUBE • DUAL GAUGE TUBE • INSTRUMENTATION TUBE • CONDENSER TUBES IN CUPRO-NICKEL, ALUMINUM BRASS, ADMIRALTY, HERCULOY (Silicon-Bronze), ARSENICAL COPPER, MUNTZ METAL AND OTHER ALLOYS • ALUMINUM TUBE, SHEET AND EXTRUSIONS • SMALL AND LARGE PLATES IN CUPRO-NICKEL, COPPER, HERCULOY, MUNTZ METAL, NAVAL BRASS AND ADMIRALTY • LOW CARBON STEEL HEAT EXCHANGER TUBE TO ASTM SPEC. A-214 AND A-334 GRADE "C" • BOILER TUBE TO ASTM SPEC. A-178.

Unsurpassed in Metering Value...

Unique Magnetic System

free-floating...surge resistant...self-cleaning

The true magnetic flotation principle used in the Sangamo J3 Watthour Meter is unique! Two bonded cylindrical Alnico magnets with opposing magnetic fields float the disk freely.

The extra high coercive force Alnico material used in the magnetic system retains its strength even through repeated lightning and load surges, assuring accurate long-term registration.

Sangamo manufactures the magnets for precise magnetic and mechanical uniformity to assure performance stability in the J3 floating system. These magnets maintain a visible 1/16 inch cushion—magnetic particles are repelled from the gap . . . eliminating erratic light load registration.

This true magnetic floating system is designed for easy and positive control of disk position and endshake. It never requires costly maintenance or replacement . . . the floating system is guaranteed for the life of the meter.

true MAGNETIC flotation J3

SANGAMO ELECTRIC COMPANY
SPRINGFIELD / ILLINOIS

PW61-3

PERSONAL BRIEFS

Miles O'Malley has been named manager of Douglas County PUD.

E. P. Ericson has been boosted to assistant general manager of Tennessee Valley Authority.

Gerald B. Bishop has been appointed advertising manager of Mississippi Power & Light Co.

Frank B. Mahon has become area development department manager for Duquesne Light Co.

The new assistant chief mechanical engineer for nuclear power projects at Gibbs & Hill, Inc, is **A. C. Stanojev. Herman Meswarp** and **Haskins Eubank** became assistant chief electrical engineers for nuclear and conventional power projects, respectively.

Iowa Southern Utilities Co has named **James R. Jones** treasurer and **J. E. Thomas** assistant treasurer.

At Indianapolis Power & Light Co, **Glenn Ray** has become assistant vice president-industrial relations, and **David E. Schnorr** has been named assistant secretary.

Charles E. Richards has been made general superintendent of Cleveland Electric Illuminating Co's steam power division, succeeding **Edwin C. Cawrse** who will retire.

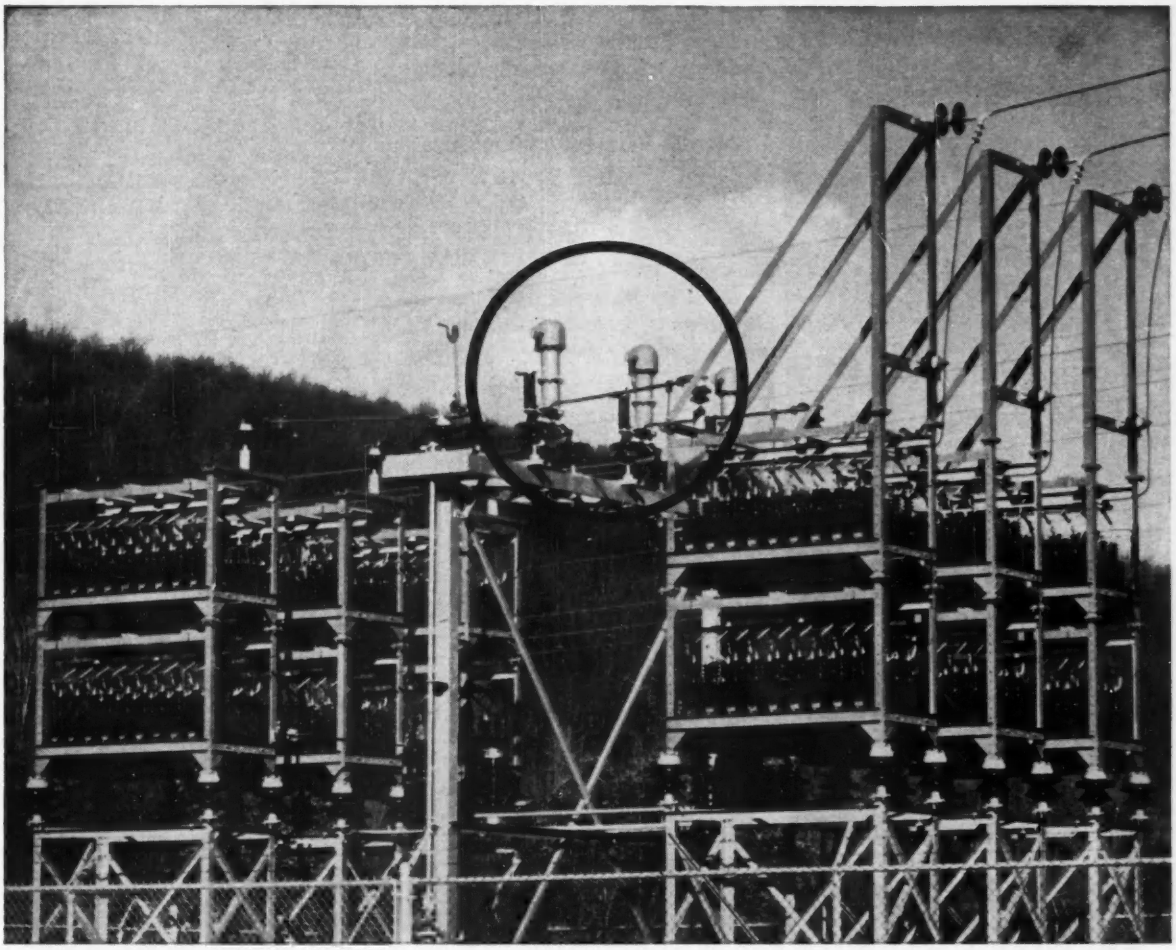
H. M. Lind has been promoted to chief design engineer for Pacific Power & Light Co. **Joe T. Lienert** succeeded Lind as assistant chief design engineer.

Hydro-Electric Power Commission of Ontario has named **D. J. Gordon** executive director-marketing. **D. B. Ireland** became consumer service director, and **W. H. Edwards** was named regions administrative director at the Toronto head office.

Richard H. Wood has been appointed assistant administrator of the Rural Electrification Administration.

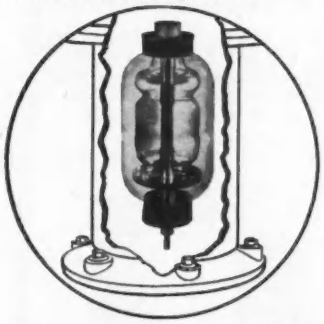
William Schmidlapp has become

(*Continued on page* 92)



VACUUM SWITCHES PICKED BY PENELEC TO SWITCH HIGH VOLTAGE BANK-TO-BANK CAPACITORS

The switchgear controlling these capacitors are new Hi Voltage-Joslyn 34.5 kv Heavy Duty Vac-Rupter® switches utilizing Jennings vacuum power switches as the interrupting element.



Jennings type R9G vacuum power switch for 34.5 kv load break duty, 250 amp rated thermal currrent. Maximum fault interruption rating is 2000 amps rms.

Alert to the consumers' need for steady, uninterrupted electrical service, PENELEC chose vacuum switches to switch these two 5400 KVAR, 23 kv capacitor banks. Jennings vacuum switches are ideally suited to this type of service because they interrupt capacitive loads at the first current zero and recover dielectric strength fast enough that no restrikes occur. These characteristics are inherent in vacuum switches because of the very fast deionization of the contact gap during and immediately after interruption. Vacuum contacts in this type of service require no maintenance over an operating life of ten years or more.

This particular installation is only one of hundreds of successful power installations using Jennings vacuum switches since Jennings pioneered their use over six years ago. And behind that first commercial power application in 1955 was seven years of research, development, and the experience gleaned from hundreds of lighter duty industrial vacuum switch applications in constant use in the field.

Jennings vacuum switches have proven equally as effective in load break switching, transformer magnetizing current and inductive switching, fault current interruption, and high voltage transmission line dropping.

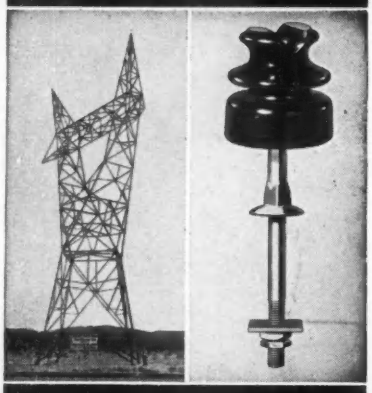
Our distribution of vacuum switches is through switchgear manufacturers who design and build complete switchgear equipment utilizing Jennings vacuum switches.

More detailed information on our 10 sizes of power switches is available on request

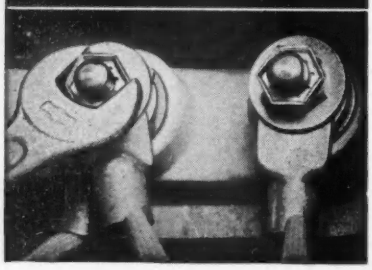
RELIABILITY MEANS VACUUM / ***VACUUM*** *MEANS* **Jennings®**

JENNINGS RADIO MFG. CORP., 970 McLAUGHLIN AVE., SAN JOSE 8, CALIF., PHONE CYpress 2-4025

Assemblies stay tight!



Connections stay tight!



—when locked with

PALNUT LOCK NUTS

FOR years, PALNUTS have been the standard lock nuts of the utility industry—on steel towers, wood pole hardware, connectors, disconnects, switches, fittings, transformers, etc. Here's why: PALNUT Lock Nuts stay tight under severest vibration, are very low in cost, apply fast and easily, require little space. Available in full range of sizes, in plain, Parkerized and Hot Dip Galvanized steel; also silicon bronze.

Samples and Literature on request

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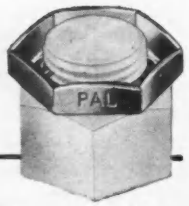


PALNUT®
LOCK NUTS

executive secretary of the Assn of Illinois Electric Cooperatives, succeeding **A. E. Becker** who recently retired.

Robert E. McIlvane has been named manager-communications products division of Anaconda Wire & Cable Co.

General Precision, Inc, has appointed **Dr Walter R. Hedeman** coordinator of advanced development, engineering division of GPL Division.

The following have retired: **Alwin G. Steinmayer,** administrative vice president of Line Material Industries; and **Arthur J. Sherburne,** former insulating products engineering manager, General Electric Co.

Frederick R. Smith has been named customer service manager for the lighting products division of Sylvania Electric Products Inc, subsidiary of General Telephone & Electronics Corp. **Jerry R. Schmitt** became assistant product manager for the large lamps operation of the lighting products division.

J. Brady Stoughton Jr has become south Atlantic region manager for Line Material Industries, McGraw-Edison Co.

Frank E. Stehlik, former general manager of General Electric Co's low-voltage switchgear department, has joined Philco Corp as manager of the communications and weapons division of the government and industrial group.

At P. R. Mallory & Co, Inc, **Charles A. Barnes** has become administrative vice president. He was formerly vice president-finance.

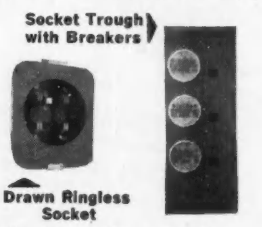
OBITUARIES

Harold Goodwin Jr, 73, retired consulting electrical engineer . . . **Robert C. Davenport,** 68, retired construction engineer for Lousiville Gas & Electric Co . . . **Ray F. Sparrow,** 63, executive vice president of P. R. Mallory & Co, Inc . . . **Albert E. Bridges,** former sales promotion manager for Niagara Mohawk Power Corp.

Searching for Meter Sockets?

look to . . .

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A Subsidiary of
The Union Metal Manufacturing Co.



Write for a free Catalog outlining types and sizes of meter socket equipment, test switches, test blocks, reactiformers and enclosures.

FOR John Doe Electric Company
C.O. NO. 43967 ITEM 2
F.O. NO. 2-A-3695 ITEM 2
NO. OF UNITS 30
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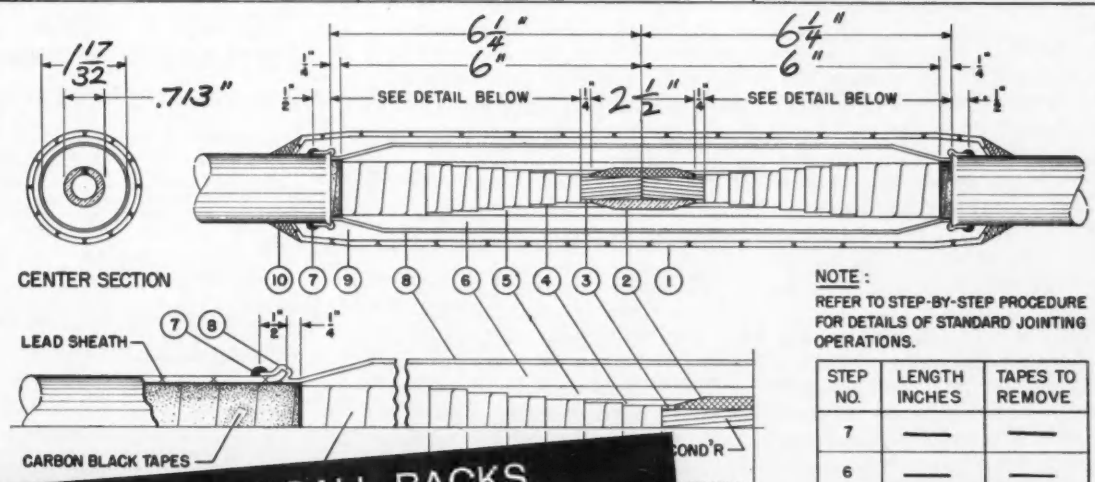
ANACONDA WIRE & CABLE CO.
ENGINEERING DEPARTMENT — HASTINGS-ON HUDSON, N.Y.

UNIT PACKAGE JOINTING MATERIAL

STRAIGHT JOINT FOR TYPE CB PAPER – LEAD CABLE
ONE CONDUCTOR, SIZE 4/0 AWG ~~MCM~~
CONDUCTOR SHAPE ROUND
INSULATION THICKNESS .175" ~~/64"~~
LEAD SHEATH THICKNESS .090" ~~/64"~~
RATED VOLTAGE 15 KV GRD. ~~UNGRD.~~



NOTE:
REFER TO STEP-BY-STEP PROCEDURE FOR DETAILS OF STANDARD JOINTING OPERATIONS.

STEP NO.	LENGTH INCHES	TAPES TO REMOVE
7	—	—
6	—	—
5	6	CB TAPES
4	3 3/4	11
3	3	8
2	2 1/4	7
1	1 1/2	ALL

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2	SPLIT TINNED COPPER CONNECTOR, SIZE 4/0 AWG ~~MCM~~	1
3	V.C. TAPE, 3/16 IN. WIDE x 4 YD. PER ROLL	1 ROLLS
4	V.C. TAPE, 1/2 IN. WIDE x 4 YD. PER ROLL	1 ROLLS
5	V.C. TAPE, 3/4 IN. WIDE x 4 YD. PER ROLL	2 ROLLS
6	V.C. TAPE, 1 IN. WIDE x 4 YD. PER ROLL	9 ROLLS
7	BAR SOLDER	1/2 LB.
8	COPPER MESH TAPE, 3/4 IN. WIDE x 6 YD. PER ROLL	1 ROLLS
9	FILLING COMPOUND, NO. 150 SUPERSEAL	2 PINTS
10	WIPING SOLDER	2 LB.
11	FLUSHING COMPOUND, NO. 250 SUPERSEAL	1 PINTS
12	STEARINE FLUX	1 OZ.
13	PAPER PASTER	4
14	COTTON TAPE, 1 IN. WIDE x 3 YD. PER ROLL	1 ROLLS
15	COTTON YARN 1/8 OZ. PER ROLL	1 ROLLS
16	WASTE ENDS	2 OZ.
17	ALOXITE CLOTH	1-1FT. ROLL

OIL PACKED IN #300 SUPERSEAL

Utilization Transformer Cuts Residential UG Cost

(*Continued from page* 58)

underground 120/240-v services. The costs for such comparison were obtained locally. Subject to variation elsewhere, they are believed to be quite accurate for this purpose.

It should be noted that, whereas the low-voltage service cable must match the size of the customer's service entrance to avoid excessive voltage drop, the high-voltage, No. 8, 15-kv service cable has a negligible voltage drop for any comparable load. This allows the utility to take advantage of the inherent overload capability (and additional voltage drop) in the utilization transformer, and to size the unit in accordance with experience with the customer's demand.

Experiences to date with residential demands, including all-electric homes, indicate that very few will exceed a 30-kva demand and most will be 20 kva or less. With recent improvements in transformer insulation and lower transformer impedances, however, it would be feasible to load the transformer to 300% of nameplate rating for short peaks. This would not cause excessive voltage drop or shorten the life of unit unduly.

An example of the economics of the utilization transformer can be seen by applying the costs in Fig 4 to the following actual service situation. A customer had a 400-amp, 120/240-v, single-phase service entrance switch fused at 250 amp. (The highest recorded demand to date is 30 kva). Service was from a 7.62-kv primary over a 106-ft span of primary to a 15-kva transformer, and thence over a 45-ft span of secondary to his yard pole. Cost of these overhead facilities was $520, including the transformer. The customer paid for a 10-ft underground run of three 300-MCM, 600-v, single-conductor cables in duct. Including the yard pole, total cost was $475.

The combined cost of the overhead and underground facilities in the original service scheme was $995. Today, an entire service run of 250 ft (from primary to house) could be installed underground for $580 for the high-voltage service and utilization transformer. The saving of $415 as well as the improved appearance favors the utilization transformer scheme. In addition, the customer would be relieved of maintaining the underground service, as the utility would own and maintain it and the utilization transformer. The total cost of $580 can be equitably shared to benefit both the utility and the customer.

License Requests for Columbia Dams Due

British Columbia Premier W. A. C. Bennett has published an order-in-council giving the British Columbia Power Commission permission to apply on June 15 for water licenses to build dams as part of the proposed upper Columbia River hydroelectric development project.

BCPC plans to apply for licenses to build Mica Creek, High Arrow and Duncan Lake dams after a full report from Caseco Consultants, Ltd, on the overall river program outlined under Columbia River treaties.

Caseco was making studies jointly for BCPC and the BC Energy Board, which expects to produce a full comparison report on the Columbia and Peace River schemes by the middle of August.

Bennett termed the granting of permission further proof that the provincial government was doing everything in its power to expedite the Columbia program. "Before the hearings are finished we hope to have financial arrangements worked out with Ottawa. We expect to reach a sound partnership deal satisfactory to both sides," Bennett said.

BCPC will submit three separate license applications to the provincial water comptroller on June 15. Public hearings will then be arranged by the government.

First hearing is not expected before July 1, and hearings should last for some weeks after that date.

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CONTRACT NO. 217
P.C.R. REF. NO. 1054/1012

Tenders are invited for the supply and erection of 33 kv Main Switchgear for the Port of Spain "B" Power Station.

Tenders are invited only from firms who are prepared to submit complete tenders for each contract.

A short precis of the extent of the works for which complete and comprehensive offers are invited may be had on application to Messrs. Preece, Cardew & Rider, 8, 10 & 12 Queen Anne's Gate, London, S.W.1.

Tender documents, which will be available from 5th June 1961 and returnable by midday on 4th September 1961, may be obtained from the same address on receipt of a payment by cheque for £15. O. O. in favour of Preece, Cardew & Rider. This payment will not be refunded.

At a later date offers will be invited for Turbo-Alternators, Transformers, Auxiliary Switchgear and Cabling. Persons interested in such should NOT now apply, but await further advertisements.

The Trinidad & Tobago Electricity Commission does not bind themselves to accept the lowest of any Tender, nor will they be responsible for any costs incurred by Tenderers on making their Tender.

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Manager for Rural Electric System. The Grayson Rural Electric Cooperative, Grayson, Kentucky, serving 6200 members. Must have administrative ability to direct all phases of electric cooperative. Permanent position carrying substantial opportunity for qualified person. Replies confidential—closing date June 15, 1961. Please write Mr. L. C. White, President, Grayson Rural Electric Coop, Grayson, Kentucky, for application.

Utility Supervisor—Man capable of assisting in the performance of all duties in connection with the operation, maintenance and supervision of a municipally-owned electric and water utility in a community of 800 people. Progressive community. New high school, sewage plant to be installed in 1962, twenty minutes from city of 60,000. Mail applications to Arthur C. Hoyt, Utility Clerk, Hazel Green, Wisconsin. Please state age, experience, qualifications and salary expected.

Electrical Engineer, about 32, with 5 years experience in the electric distribution and transmission division, particularly familiar with construction and estimating with some selling experience. Location with Ohio Electrical Line Contractor. Please furnish detail experience and qualifications. P-6844, Electrical World.

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All replies confidential. Send resume stating education, experience, salary desired to Herbert H. Cooke, American Electric Power Service Corp.

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Tells NELPA Be Chary on 'Buys' (*Continued from page 55*)

mating distribution transformer loads from energy consumption was reviewed by C. F. Mitchell, RT&E Corp. While not a cure-all, the method provides a tool by which more effective use is made of distribution transformer investment, he said. The initial set-up cost can usually be recovered in the first year or two from savings in transformer purchases for reinforcement. The continuing annual cost may be recovered out of savings in annual investment charges due to higher loading. There are other benefits difficult to evaluate. Operating labor for the system is almost entirely clerical, Mitchell pointed out.

Digital demand recorders were installed in 25 selected homes and some large commercial and industrial locations as part of engineering studies, reported Naylor Cole, Pacific Power & Light Co. The homes are of medium size and include electric heat, range, and water heater. The objective is to learn more about typical demands of all-electric homes. In commercial and industrial establishments, the digital demand recorder proved helpful in showing need for adequate wiring, said Cole.

One important urgency for finding uses for street lighting equipment is the trend toward suburban living, said D. W. Morrill, Line Material Industries. Rural and suburban residents want lighting for safety, outdoor work at night, recreation, and showing off their property. Hence many utilities have successfully embarked on all-night-lighting campaigns.

The utility now offers to furnish the cable, bracket, and a luminaire with photoelectric control and installs this equipment, free, on a company pole. For each fixture, the customers pay a flat monthly rate, added to the regular electric bill.

PCEA to AEC Offer: 'No Thanks!' (*Continued from page 59*)

obtain a construction permit and an operating permit, Quinton asked. At present, he noted, the owner has no such assurances.

PG&E will install its last convention units in the late 60's, said C. C. Whelchel, citing his company's belief that atomic power will be a "must" in California in the foreseeable future. His company, he added, is completing studies on a large-scale nuclear plant near San Francisco. When built, this so-called Bay Area plant will have a capacity in excess of 300 Mw.

Nuclear power could be economically feasible on the island of Oahu before it is so in many parts of the mainland, declared L. W. Lengnick, Hawaiian Electric Co. Noting the islands' dependence on oil as a fuel, Lengnick pointed out that residual oil may become too valuable to burn in a furnace because of its increased use in the petrochemical industry.

Yet the islands must proceed cautiously toward nuclear power, he said, giving these reasons:

1. The reliability of generating units is critical to the islands' isolated systems on which an outage of more than one unit would probably result in dropping load.

2. Technical assistance from the mainland would not arrive fast enough.

3. Hawaiian Electric's lack of finances.

The company nevertheless is continuing to study nuclear power as a preparation for an eventual installation, he said, noting that Hawaiian Electric has purchased 485 acres for a power plant site on the west shore of Oahu.

Plans are to install two conventional 82.5-Mw units but later to study the practical aspects of a nuclear installation with regard to type and size, he said, adding that the study would also embrace dependability and cost of nuclear power as compared with those of conventional power.

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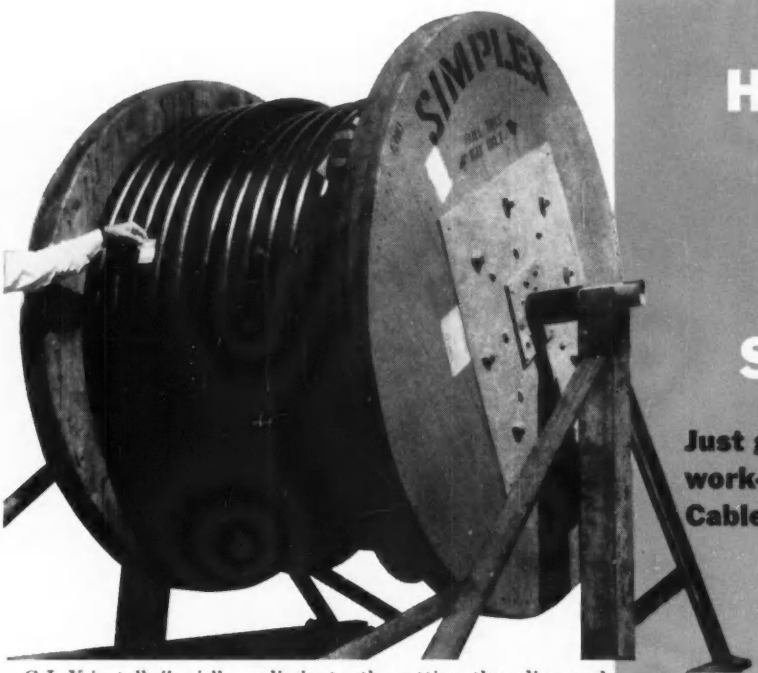

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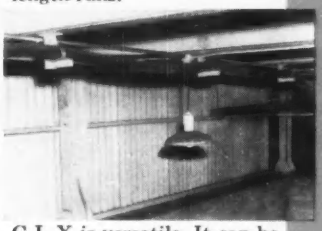

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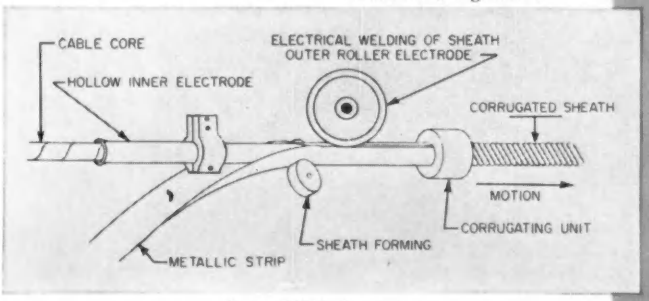

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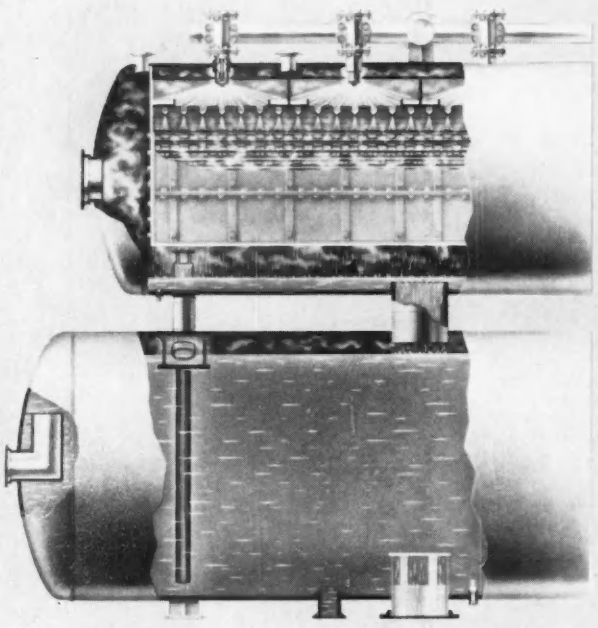

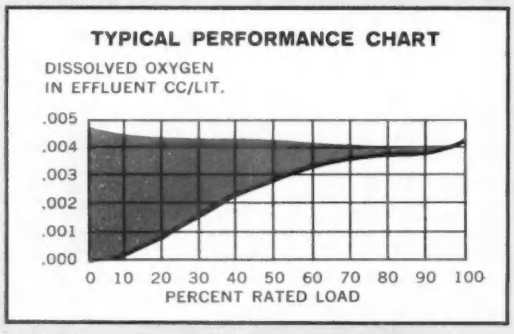

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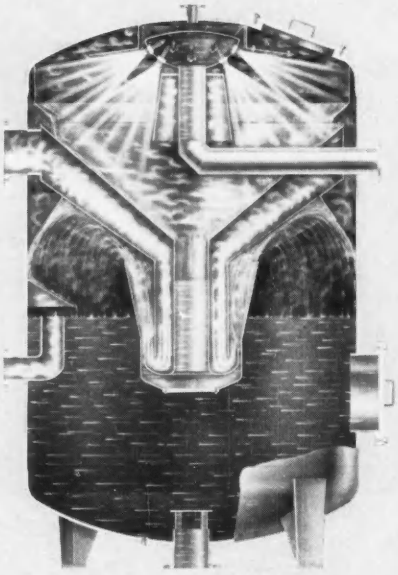

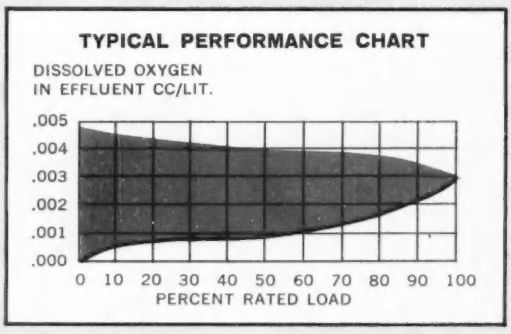

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